

Innovations in Achieving Sustainable Food Security in Eastern and Southern Africa

Editors
Workneh Negatu
and
Herman Musahara



Organisation for Social Science Research
in Eastern and Southern Africa (OSSREA)

VISIT...

LANZAROTE
Caliente.COM

Innovations in Achieving Sustainable Food Security in Eastern and Southern Africa

Editors

Workneh Negatu

and

Herman Musahara



**Organisation for Social Science Research
in Eastern and Southern Africa (OSSREA)**

© 2016 Organisation for Social Science Research in Eastern and Southern Africa (OSSREA)

Published 2016

Printed in Ethiopia

ISBN: 978-99944-55-87-4

All rights reserved.

Organisation for Social Science Research in Eastern and Southern Africa

P. O. Box 31971, Addis Ababa, Ethiopia

Fax: 251-11-1223921

Tel: 251-11-1239484

E-mail: info@ossrea.net

Website: www.ossrea.net

Copyediting and Layout: *Matebu Tadesse*

Formatting: *Alemu Tesfaye*

OSSREA acknowledges the financial support of the Danish Development Agency (DANIDA), without which this book wouldn't have been initiated.

Table of Contents

INTRODUCTION	xiii
<i>Workneh Negatu</i>	
CHAPTER ONE.....	1
The Puzzle in Implementation of Uganda's Food Security Policy	
<i>Jennifer T. Tumushabe</i>	
CHAPTER TWO.....	31
Rural Livelihoods and Agricultural Innovation Systems in Malawi	
<i>Mariam A.T. Kadzamira</i>	
CHAPTER THREE	57
Some Indicators of Food Security Challenges in Eastern and Southern Africa: Lessons from the Land Use Consolidation in Rwanda	
<i>Herman Musahara</i>	
CHAPTER FOUR	89
Development of an Interdisciplinary School-Based Intervention to Address Food and Nutrition-Related Needs in Poor Communities in South Africa	
<i>Ronél Ferreira, Karien Botha, William Fraser and Peet du Toit</i>	
CHAPTER FIVE	129
Harnessing Indigenous Knowledge and Scientific Knowledge to Promote Farmer Multi-Stakeholder Partnerships in Food Security in Kakamega County, Kenya	
<i>Boaz S.W. Maloba</i>	
CHAPTER SIX	171
Farmers' Adaptive Capacity on Household Food-resource Handling Procedures and Food Security in Rural Western Kenya	
<i>Oino P. Gutwa</i>	

CHAPTER SEVEN 207

Institutions and Technological Innovation in Smallholder Agriculture:
Lessons from a Case Study in *Bati* and *Kewot woredas* (Districts) in
Northeastern Ethiopia
Workneh Negatu

CHAPTER EIGHT 225

Land Tax and the Sustainable Use of Land for Food Security in
Post-Land Reform in Zimbabwe
Peter MacKaye

CHAPTER NINE 251

A Holistic Strategy for Improving Gender-Power Relations and Food
Security in Tigania, Meru County, Kenya
Constance Rose

CONCLUSION 289

Herman Musahara

Acronyms

AAU	Addis Ababa University
AIDS	Acquired Immunodeficiency Syndrome
AIKS	African Indigenous Knowledge Systems
AIS	Agricultural Innovation Systems
AKIS/RD	Agricultural Knowledge Information Systems /Rural Development
AKIS	Agricultural Knowledge Innovation Systems
AKS	Agricultural Knowledge Systems
ARC	Agricultural Research Council
ASK	Agricultural Society of Kenya
AU	African Union
BAZ	Bankers Association of Zimbabwe
BBM	Broad Bed Maker
CAADP	Comprehensive African Agriculture Development Programme
CDD	Convention to Combat Desertification, Uganda
CE	Capacity Enhancement
CIFORD	Community Initiatives for Rural Development, Kenya
CIP	Crop Intensification Programme
CTSL	Care and Support for Teaching and Learning
DANIDA	Danish International Development Agency
DAP	Diammonium Phosphate (soil fertiliser)
DAs	Development Agents
DPPC	Disaster Prevention and Preparedness Commission
EAC	East African Community
ERI	Enabling Rural Innovation
ESK	Economic Survey of Kenya
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
FESLM	Framework for Evaluation of Sustainable Land Management
FGD	Focus Group Discussion
FGM	Female Genital Mutilation
FPR	Farmer Participatory Research
GDP	Gross Domestic Product
GFW	Global Fund for Women
GMOs	Genetically Modified Organisms
GoK	Government of Kenya
HIV	Human Immunodeficiency Virus
ICT	Information Communication Technology
IDs	In-depth interviews
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute

IGAD	Intergovernmental Authority on Development
IK	Indigenous Knowledge
IMF	International Monetary Fund, Uganda
KARI	Kenya Agricultural research Institute
LC	local councillors, Uganda
LUC	Land Use Consolidation, Rwanda
MAAIF	Agriculture Industry Animal and Fisheries, Uganda
MDGs	Millennium Development Goals
MINAGRI	Ministry of Agriculture, Rwanda
MOGLSD	Ministry of Gender, Labour and Social Development, Uganda
MoH	Ministries of Health, Uganda
NAADS	National Agricultural Advisory Services, Uganda
NAP	National Agricultural Policy, Uganda
NARO	National Agricultural Research Organisation, Uganda
NARS	National Agricultural Research System
NCDs	Non-Communicable Diseases
NCPB	Nation Cereals and Produce Board, Kenya
NEPAD	New Partnership for African Development
NFA	National Forestry Authority, Uganda
NFCS-FB	National Food Consumption Survey-Fortification Baseline, South Africa
NFNC	National Food and Nutrition Council, Uganda
NFNP	National Food and Nutrition Policy
NFNS	National Food and Nutrition Strategy, Uganda
NFP	National Forestry Plan, Uganda
NGOs	Non-Governmental Organisations
NRM	National Resistance Movement, Uganda
NSNP	National School Nutrition Programme
OAF	One Acre Fund
PEAP	Poverty Eradication Action Plan, Uganda
PMA	Plan for Modernisation of Agriculture
PMA	Plan for Modernisation of Agriculture, Uganda
PRA	Participatory Reflection and Action
PSM	Propensity Score Matching
R&D	Research and Development
RAAKS	Rapid Appraisal of Agricultural knowledge Systems
SAIS	Sustainable Agricultural Innovation System
SIDA	Swedish International Development Agency
SMEP	Small Micro Enterprises
SPSS	Statistical Package for the Social Sciences
SSA	Sub-Saharan Africa
U.K.	United Kingdom
UNDP	United Nations Development Programme
UNFNP	Uganda National Food and Nutrition Policy
USAID	United States Development Agency

WDI	World Development Indicators
WFP	World Food Programme
WHO	World Health Organisation
Win-LIFE	Wellness in Lifestyle, Intake, Fitness and Environment
WRCCS	Western Region Churches Community Services
ZIDERA	Zimbabwe Democracy and Economic Recovery Act

About Authors

Workneh Negatu: Workneh Negatu is an Associate Professor of Agricultural Economics and Development, in the College of Development Studies at the Addis Ababa University (AAU), where he teaches and advises students in the Masters and Ph.D. programs. He has a Ph.D. in Development Studies/Agricultural Economics from the University of East Anglia, U.K. (1997), a M.Sc. in Regional Economics and Planning from Martin-Luther University, Wittenberg, Germany (1986), and a B.Sc. degree in Agricultural Economics from Alemaya College of Agriculture–Addis Ababa University, Addis Ababa, Ethiopia, 1979/80. Dr. Workneh has published extensively in referred journals, including the *Journal of Economics and Sustainable Development*, *Journal of Applied Economics and Finance*, *Journal of Land Degradation and Development*, *e-Journal for Research and Innovation Foresight*, *Journal of Agricultural Extension and Rural Development*, the *EASSRR Journal*, *The Journal of Development Studies*, *Ethiopian Journal of Development Research*, to mention recent ones. He also has contributed chapters in peer-reviewed books, and edited and co-edited many books. Currently, Dr. Workneh is also serving as Chief Director for Business Development, Training and Consultancy and Endowment Office under the Office of Vice President for Institutional Development, for which he is also an Acting vice President.

Jennifer T. Tumushabe: Jennifer T. Tumushabe is a Ugandan, Ph.D. candidate in Sustainable Development at the Institute of Inter-disciplinary Training and Research, Mbarara University of Science and Technology (MUST). She holds a Master's and Bachelor's degree in Environmental Science. She is a Researcher in the Department of Environment and Natural Resources Management at Kabale University, Uganda. Her research interests are climate change mitigation and adaptation policies and impacts on rural communities, with emphasis on food security. She is an environmental activist who is currently a Country Coordinator of Clean Air Action Corporation Programme, which is implementing the Carbon Emission Reduction Policies and Practices in South-Western Uganda.

Mariam A.T. Kadzamira: Mariam A.T. Kadzamira holds a Ph.D. in Agricultural Economics (Policy) from the University of Pretoria, South Africa. She also holds a Masters and a Bachelors degree in Agricultural Economics both from Bunda College of Agriculture, Malawi. She has worked extensively in the agricultural sector with experiences in Malawi, Zambia, Zimbabwe, Mozambique with different organisations including the International Food Policy Research Institute, The International Center for Tropical Agriculture, The Farmers Union of Malawi and the Ministry of Agriculture. She recently rejoined FUM as Director of Institutional Development. She is married to Limbikani H.K. Kadzamira and they live in Lilongwe, Malawi.

Herman Musahara: Herman Musahara is currently Acting Executive Director of the Organization for Social Science Research in Eastern and Southern Africa (OSSREA). He holds a PhD in Development Studies from the University of Western Cape in South Africa, and an M.A in Economics from the University of Dar es Salaam. He has more than 30 years experience as an academic, researcher and consultant. He was formerly Dean Faculty of Economics and Management 2005, Director of University Consultancy Bureau 2008, Director of Planning and Development 2010 Acting Vice - Rector Academics in 2011–2012 at the former National University of Rwanda. He was till April 2014 an Associate Professor in the College of Business and Economics of University of Rwanda. Besides teaching Development Economics, Poverty Analysis and Research Methodology at post-graduate level, he has researched, consulted and published in several fields of the social sciences including poverty analysis, human development, environment, land and land use, governance, post-conflict transitions, including post-Genocide, entrepreneurship, SMEs, value chains and agricultural development.

Ronél Ferreira: Ronél Ferreira completed her initial qualification as home economics high school teacher (BHHk Ed) in 1992. She also holds a further diploma in teaching, two Honours degrees, two Master's degrees and a PhD degree in Educational Psychology, which she obtained in 2006. Ronél is currently associate professor and head of department in Educational Psychology at the University of Pretoria, South Africa. Her research focus areas are psychological well-being, coping and resilience within the context of vulnerability, participatory reflection and action research, and intervention research in support of community development, health and well-being.

Karien Botha: Karien Botha completed her initial qualification (BA: General) degree in 2000. She holds a post-graduate certificate (PGCE) in Education, a BPsych (School counselling) degree and a Master's degree in Educational Psychology. Currently, Karien is completing her Ph.D. degree in Educational Psychology. Karien is a lecturer at the department of Educational Psychology, University of Pretoria, South Africa.

William J. Fraser: is a chartered biologist (CBIOL), Fellow of the Royal Society of Biology (FSB) and member of the South African Academy for Science and Arts (M.Acad.SA). He has also received a C2-rating as established researcher from the South African National Research Foundation (NRF). As subject methodologist, he specialises mainly in curriculum development, instructional design and programme evaluation. His prime research focus remains teaching and learning in the Life Sciences and he has also supervised many masters and doctoral students in the methodology of the Life Sciences. The social context of curriculum (environmental education and indigenous knowledge) as well as the

community's engagement in teaching and learning remains another of his interests.

Peet du Toit: du Toit has a Ph.D. in Physiology, a M.Sc. and B.Sc. Honours in Microbiology, and a B.Sc. in Physiology and Microbiology, all from the University of Pretoria, South Africa. Dr. Toit is a Professor of Neuroscience and Physiology in the Department of Physiology, University of Pretoria, UGSM-Monarch Business School, and Switzerland Associate Professor, Department of Physiology, University of Pretoria, and Head of Neuroscience Group, University of Pretoria

His work concentrated on urokinase/sialidase activity, kidney stones, testosterone and essential fatty acids. The research yielded 14 articles from 1991 to 1997. He has published 61 articles, presented in 108 conferences, workshops and short courses. he also has supervised and co-supervised 59 postgraduate students and developed four exercise- and neuroscience multimedia packages.

During 2014, he together with colleagues, developed the Win-LIFE (Wellness in Lifestyle, Intake, Fitness and Environment) intervention (a health promoting intervention targeted at Grade 4 to 6 learners) and Overall Wellness Indicator kit. Win-LIFE aims at enriching the current South African school curriculum and assisting schools to become inclusive centres of care and support.

Boaz Maloba: Boaz Maloba is a Ph.D. student in the Department of English and Languages, majoring in Applied Linguistics at Kenyatta University. His research interests lie in discourse analysis with special focus on gender, media and communication. He is a part-time lecturer at Kibabii University College in the Department of Linguistics and a long time tutor and teacher of English and communications skills in various institutions. He has authored a book entitled *Manifestation of Gender in Radio Call-in Shows on Mulembe FM*⁹. Maloba has written a number of peer reviewed articles in the areas of communication, media, gender, and social protection. He is currently working on a communication skills manual for undergraduates and diploma students.

Peter Makaye: Peter Makaye is a Lecturer in Development Studies at Midlands State University (MSU) in Zimbabwe. He is studying towards a D.Phil. in Development Studies at Nelson Mandela Metropolitan University (NMMU) in South Africa. He has an M.A. and B.A. Hons. degrees in Economic History from the University of Zimbabwe (UZ) and an M.BA. from MSU. . Makaye is interested in political economy in Zimbabwe in general and land and agrarian issues in particular. To date Makaye has slightly over 10 publications in refereed journals.

Oino P. Gutwa: Mr. Gutwa is currently doing a Ph.D. in Anthropology (Nutrition and Development Option) at Moi University, Eldoret, Kenya (Due July, 2016). He has a Master of Arts in Sociology (Community Development and Project Management) from Egerton University, Njoro, Nakuru, Kenya, (2013); a Bachelor of Arts— Anthropology, Moi University, Eldoret, Kenya (2008); and a Diploma in Project Management from, Kenya Institute of Management Studies-KIM, Eldoret, Kenya (2010). His major research interest is in food security and in particular, institutional innovations on food security and nutrition, household food security, gender dynamics and food security, and farmers' adaptive capacity to household food-resource handling procedures.

Constance R. Ambasa: C. R. Ambasa is a social scientist and former lecturer in the School of Humanities and Social Sciences at Kenyatta University, Kenya. She holds a Ph.D. degree from Kenyatta University and was a Post-Doctoral Fellow at the School of Public Health, Yale University, Connecticut USA from 2004 to 2005. She has conducted many studies on social issues related to gender, education, HIV, AIDS, family planning, reproductive health, social protection and youth studies. Her recent publication focused on an assessment of food security and nutrition in tea growing areas of Kenya in the context of climate change. The project was funded by the Food and Agricultural Organization of the United Nations.

INTRODUCTION

Workneh Negatu

The G8 and G20 Leaders of Food Security Initiative in 2011 identified rapid population growth and climate change and variability (including absence and unpredictability of rains), which affect food production and agricultural productivity and cause food price spikes, as challenges facing the food systems in low and middle income countries (Hussien and El Harizi 2013, 185; Requier-Desjardins 2013). Some authors, such as Rahmato (2009) and Brown and Teshome (2007) underline that farmers engaged in smallholder farming system, the dominant sector in Sub-Sahara Africa, are highly vulnerable to poverty and food insecurity. Important causes of vulnerability include very high national inflation rates; water shortage for humans and water and pasture shortage for animals in the arid and semi-arid areas of the countries; poor-quality animal breeds; livestock diseases; and, tribal/clan conflicts (USAID, WFP and FEWSNET 2009).

Acemoglu and Robinson (2012) and Asefa, Negatu and Mogue (2012) recommend building inclusive institutions that lead to industrialisation as a way out of poverty. According to FAO, WFP, and IFAD (2013) and Hussein and El Harizi (2013), policies aimed at enhancing smallholders' productivity and increasing food availability can achieve hunger reduction even where poverty is widespread. When they are combined with social protection and other measures that increase the incomes of poor families, thereby enabling them to buy food, they can have an even more positive effect and spur rural development by creating vibrant markets and employment opportunities, and making possible equitable economic growth.

There have been a number of innovations that play instrumental roles to enhance food security. For example, information communication technology (ICT)-based resources are powerful tools for income generation and access to education, extension and other social services (May, Dutton, and Munyakazi 2014; Ogbu and Mihyo 2000).

Engaging landless youths and youth volunteers as a useful strategy for introducing and scaling up innovations in rural and community development has also been documented as an insightful social innovation (Ogbu and Mihyo 2000), as is the use of media and ICTs to share right messages, skills and knowledge on production, preparation and consumption aspects of food. These skills and knowledge are ways of enhancing the human agency, and the agency claims the rights for food, deals with risks and disasters and keeps oneself and others from food-insecurity and malnutrition (Rahmato 2009; Sen 1999).

This book entitled *Innovations in Achieving Sustainable Food Security in Eastern and Southern Africa* addresses roles and issues related to social and institutional innovations and approaches in food security in Southern and

Eastern Africa. They include implementation of food security policy, rural livelihood and agricultural innovation, land consolidation for food security, interdisciplinary school-based health for food security, harnessing indigenous and modern knowledge for food security, household food resource handling for food security, institutions for technological innovation, role of land tax in food security, trade protectionism and food security, and gender-power relations in food security.

Chapter One by Jennifer discusses the ineffectiveness of policies on food security innovations that were meant to achieve sustainable food security in post-1995 Uganda. Food security policies enacted in the areas of agriculture, environment, water and land by the government of Uganda unfortunately failed to achieve the food security objectives. Jennifer argues that despite Uganda's promising policy formulations on institutional innovations, poor policy implementation hampers the achievement of sustainable food security. The study pointed out that non-implementation of food security policies resulting from corruption, poor governance, inadequate human resource, poverty, and inadequate procurement processes hinder the attainment of institutional innovation and the realisation of food security objectives. Suggested by the author is the need to strengthen viable policy control and monitoring systems and identification of potential risks that hinder food security.

Mariam Kadzamira in Chapter Two argues that rural agricultural innovation should play the role of shifting farm production systems from consumption-subsistence perspectives to market-oriented agribusiness perspective. The author argues such a shift would create an enabling environment for affordability, accessibility and availability of food at the household level. In connection with this, it is believed that innovations are key in unlocking African agriculture and in creating self-sustaining agricultural systems. The chapter provides evidence on the impact of innovation-systems-driven research interventions on rural livelihoods. The chapter also demonstrates how a paradigm shift in agricultural research from a top-down linear approach to a holistic approach driven by innovation systems concepts has contributed towards changing the rural household economy and household food security.

Musahara in Chapter Three emphasises that food insecurity is a global challenge closely linked to poverty, and that there is no freedom where there is hunger. Underlined is also that poverty is the main cause of food insecurity. The chapter reviewed food insecurity situation in eastern Africa, focusing on the lessons gathered from the land consolidation program in Rwanda. An important lesson extracted from this study is that food security needs to be seen from broader perspective. Accordingly, food security is not the issue of one sector like agriculture, but of all sectors. Moreover, it is not only a supply issue but also a demand concern of different types of consumers. It should not be forgotten that food security is also an element of human right. The results of land consolidation program through different

programs, including mainly farmers joining their land and producing in cooperative arrangement, seem encouraging in terms of increasing yields and food security, though not for all participants of the program. Noted is also that innovations are important in changing production condition and organisation of land use for food security, considering all food security components, different areas and communities and food value chains that also involve non-farm employments.

Ferreira *et al.* in Chapter Four analysed an ongoing program of interdisciplinary school-based health promotion to address food and nutrition needs in poor communities in South Africa. The authors reported on the development of an innovative health promotion intervention — Win-LIFE (Wellness in Lifestyle, Intake, Fitness and Environment), which forms part of a broader research project at the University of Pretoria, South Africa. The aim of the broader project is to investigate possible transfer of nutrition and environmental knowledge from grade 4 to 6 learners to their families, in order to support food-secure households, health and well-being in poor communities. The program first conducted a kind of baseline study to define the situation of the issues raised, employing multiple methodological approaches to and sources of data. The research tools used include Participatory Reflection and Action (PRA), document analysis, observation, field notes, photographs, posters, audio recordings and reflective journals. Findings emphasise the daily food consumption practices within the selected community; the knowledge-based, skills-based and nutrition-related needs present in the poor community; the manner in which South African policies, programs and international initiatives could be integrated into the health promotion and education intervention; and discipline specific content important for inclusion in the intervention. The Win-LIFE intervention was developed through interdisciplinary community coalitions, and focuses on nutrition and environmental education. The intervention approaches include classroom-based activities for learners, and home-based assignments for learner-parent pairs. Currently, Win-LIFE in pilot format is incorporated into the South African Life Skills curriculum (nutrition education) and Natural Sciences curriculum (environmental education) with grade 4, grade 5 and grade 6 learners in the participating schools. It is hoped that the overall impacts of the intervention on food security in the poor communities will be assessed for more lessons in the future.

In Chapter Five, Boaz Maloba investigates the importance and role of harnessing indigenous and scientific knowledge in the context of Kakamega county of Kenya to promote farmer multi-stakeholders partnership for food security enhancement. The paper argues for the need for both forms of knowledge in combination which are formulated and refined in the platform of multi-stakeholders partnership. The data for the study was gathered from focus group discussions and key informant interviews. For the analysis, the author adopted the conceptual framework of ‘Agricultural Knowledge Information Systems/Rural Development

(AKIS/RD)'. The author argues that agricultural research has come up with interventions and innovations applicable to African farming systems that are expected to simultaneously increase yields and resilience to climate change. However, most of the innovations that have been adopted take a top-down approach as dictated by international aid agencies and national governments ignoring the potential of local innovations and resources. Secondly, failure to recognise the roles, differences and inequities between men and women in agricultural production poses a serious threat to the effectiveness of agricultural development strategies. The study found out that agricultural indigenous knowledge exists, but it is rarely appreciated since there are no appropriate channels to disseminate it. On the basis of the findings, the author indicated that gender-power dynamics play a pivotal role in food (in)security in the county. He further suggested the need for integrating agricultural indigenous knowledge into modern scientific technology as an innovation that will lead to sustainable food security.

In Chapter Six, Oino Gutwa investigated farmers' adaptive capacity in Kenya on household food-resource handling to improve food security of farm households in the study area. The argument of the paper is that farmers are poorly equipped to handle resources in food system activities, such as agronomic practices, harvesting, processing, storage, exchange and consumption, which would have a great contribution to ensuring food security. The main objective of the study was, therefore, to examine how household food-resource handling practices influence food security in western Kenya. The author used both quantitative and qualitative methods. On the basis of the findings, the author suggested the importance of designing policies that incorporate adaptive capacities of smallholder farmers on household food-resource handling procedures in order to augment achievement of sustainable food security. If implemented well, the author is optimistic, such policies may also contribute to farmers' improved capacities in reducing food loss and waste in the country.

Workneh in Chapter Seven discusses the role of institutions in enhancing technological change in smallholder farming systems, drawing on case studies of extension and market institutions in two *woredas* (districts) in northeastern Ethiopia. The author argues that development of smallholder farming systems is dependent, among other factors, on technological transformation for which appropriate institutional arrangements play a crucial role. The chapter also showed use pattern of key agricultural technologies in the study *woredas*. The study used primary data and information gathered through household survey, key informant interviews, focus group discussion, and illustrative cases of institutional issues. The author concluded that farmers and agro-pastoralists view their demand for technological innovation in a holistic manner. Farmers do consider biological, mechanical, chemical, management/organisational technologies and knowledge, skill, risks, and market availability, while making decisions to use technological innovations. Noted is also the importance of

developing effective and efficient institutional arrangements for rapid technological transformation.

In Chapter Eight, Peter Makaye deals with land tax for environmentally sustainable use of land-for-food-security after land reform in Zimbabwe, employing primary qualitative data and secondary data. The chapter narrated about the land reform program that transferred land from the large-scale (white) commercial farmers to the newly resettled black farmers. The reform aimed also to ensure food security for the country. Of course, there are other factors, the author emphasises, that cause food insecurity, such as farm ownership that is accompanied by inefficient utilisation of the land, undercapitalisation of the new farmers, lack of infrastructural development on the farms and lack of security of tenure attendants to the 99 year leases. In order to control multiple farm ownership and stimulate efficient use of the country's land resources through rightsizing farms, the Ministry of Lands and Rural Resettlement has proposed a land tax of US\$1 per hectare per month. Makaye analysed the land tax in view of the desire for sustainable use of the land for food security in Zimbabwe. Based on the secondary data and interviews with participants in Zimbabwe's agricultural revolution, the author argues that the proposed commercialisation of land could be instrumental to food security provided it is complemented by an array of other interventions. The author further suggests that state's preparedness to guarantee security of tenure and support investment in the farms is essential. Financial resource is a crucial input to enhance sustainable land use for better food security. In this connection, emphasised is the need for addressing the issue of bankability of the 99- year leases. The assumption is that with this policy, those farmers burdened by the tax are bound to release excess land to other land seekers, and the resultant increased production and productivity on the new farms will increase economic activities down the value chain.

In Chapter Nine of the book, Constance R. Ambasa deals with the impact of gender power relations affecting climate change adaptation to mitigate or alleviate impacts of climate change on food security in Kenya. The study used data solicited through cross-sectional survey of some respondents, desk reviews, FGD and key informant and in-depth interviews in pastoralist areas in Meru County of Kenya. The chapter assessed contribution of the Global Fund for Women (GFW) support to rural women groups in the program, which employed a holistic approach. The integrated approach to improved livelihoods is guided by the conviction that grassroots organisations must address barriers to women's access to assets and participation, and train them in sustainable agriculture and food production in order to reduce poverty and food insecurity of households. The study found out that an integrated approach yields better outcome measures enabling men and women to acquire new knowledge for improved food security, improved production and increased diversity in crops grown and

consumed. The program also adds value to agricultural products, raises awareness of women on their human rights and enables them to own property and improve their livelihoods. The result seems to imply the importance of grassroots organisations and institutions in empowering women for better livelihood and food security.

In summary, the book chapters have attempted to demonstrate the role of social and institutional innovations in enhancing food security from various dimensions and factors. Simple technical fix and technologies in agricultural systems alone cannot solve food security problems. Technologies need to be holistic and be applicable to the socioeconomic milieu of the smallholder agriculture, for there are a number of factors and conditions that impinge on technology development, transfer and use. Different socio-economic sectors and culture at national and community levels do affect the process of technology development, transfer and use, and food security. The roles of different policies and institutions, land tenure, use and consolidation, industrial inputs supply, financial services, market access and efficiency, infrastructure development, environment management, indigenous knowledge and institutions and income level in technological transformation and food security are immense and need closer attention.

References

- Acemoglu, J. and A. Robinson. 2012. *Why nations fail: The origins of power, prosperity, and poverty*. 1st ed. The United States: Crown Publishers.
- Asefa, S., W. Negatu, and T. Mogues. 2012. Combating Food Insecurity and Rural Poverty in Ethiopia. *Ethiopian e-Journal for Research and Innovation Foresight (Ee-JRIF)*, Vol 4, No 1.
- Brown, T. and A. Teshome. 2007. Implementing policies for chronic poverty in Ethiopia. Chronic Poverty Research Centre, Addis Ababa, Ethiopia.
- Hussien, K. and El Harizi, K. 2013. 'Policies to foster innovation in the Mediterranean region.' *In: Renewing innovation systems in agriculture and food: How to go towards more sustainability?*, pp. 185–204, edited by E. Coudel, H. Devautour, C.T. Soulard, G. Faure, and B. Hubert. Wageningen: Wageningen Academic Publishers and CTA.
- FAO, IFAD and WFP. 2013. *The State of Food Insecurity in the World 2013. The multiple dimensions of food security*. Rome, FAO.
- May, J., Dutton, V., and Munyakazi, L. 2014. Information and communication technologies as a pathway from poverty: Evidence from East Africa. *In ICT pathways to poverty reduction: Empirical evidence from East and Southern Africa*, pp. 33–52, edited by Adera, E.O., Waema, T.M., May, J., Mascarenhas, O. and Diga, K. Rugby, UK: Practical Action Publishing.
- Ogbu, O. and Mihyo, P. (Eds.). 2000. *African youth on the information highway participation and leadership in community development*. Nairobi: IDRC.
- Rahmato, D. 2009. *The peasant and the state: Studies in agrarian change in Ethiopia 1950s–2000s*. Addis Ababa: Addis Ababa University Press.

- Requier-Desjardins, D. 2013. 'Innovation and social inclusion: How to reduce the vulnerability of rurals.' *In: Renewing innovation systems in agriculture and food: How to go towards more sustainability?*, pp. 109-130, edited by E. Coudel, H. Devautour, C.T. Soulard, G. Faure, and B. Hubert. Wageningen: Wageningen Academic Publishers and CTA.
- Sen, A.. 1999. *Development as freedom*. Oxford, UK: Oxford University Press.
- USAID, WFP and FEWSNET. 2009. *Ethiopia Food Security Update. March 2009*. Addis Ababa: FEWS NET Ethiopia.

CHAPTER ONE

The Puzzle in Implementation of Uganda's Food Security Policy

Jennifer T. Tumushabe

Abstract

The paper addresses the puzzling ineffectiveness of the implementation of policies on food security innovations that have been adopted to achieve sustainable food security in post-1995 Uganda. Governmental institutions work with scientists, politicians and farmers to help Uganda develop long-term solutions to food insecurity. The Government of Uganda enacts promising food security policies that unfortunately fail to achieve their food security objective. Policy failures identified in relation to food security are mainly in agricultural, environmental water, and land sectors. This paper argues that despite Uganda's promising policy formulations on institutional innovations, poor policy implementation has hampered the achievement of sustainable food security. Using qualitative approaches, data were obtained from 60 policy makers in the districts of Kabale, Kanungu, Rukungiri and Kisoro of Kigezi, Southwestern Uganda. Respondents were purposively selected bearing in mind that they are the implementers of approved policies, hence knowledgeable about all aspects concerning food security policies. Semi-structured interviews, questionnaires, and observations were used to capture desirable data. It was discovered that non-implementation of food security policies resulting from corruption, poor governance, subjective policies, inadequate human resource, poverty, and inadequate procurement processes hinders the attainment of stated institutional innovation goals and the realisation of food security objectives of the Government. The Government should obtain viable policy control systems and potential risk-identification systems to overcome food security gaps and ensure that informed decisions are central to policymaking and implementation processes.

Keywords: Food security, policy implementation, institutional innovations, challenges, failures

1. Introduction

1.1. Background

Worldwide, policy implementation is critical to any policy success in the policy sector at all levels. The social and institutional framework elaborates on the implementation of food security innovations from higher governing bodies. These are ministries, departments and agencies at the local council level. All food-security-related policies and sectors including environment,

agriculture, land, forestry, and health care conform to food security welfare transformation. According to Weaver (2010), food security policy identifies a number of potential problems that may arise in the implementation process. Failure to anticipate implementation problems when a policy reform is being enacted may lead to failure to achieve programmatic objectives, excessive costs, and perhaps even a political repercussion against the implementing organisations and policies.

Uganda is one of the developing countries with the best formulated policies. However, due to implementation problems, several policies have not been realised. Some of the viable mechanisms of supporting the implementation of policies impede the increasing productivity of Uganda's agricultural system, which is one of the most significant challenges facing global agriculture. In 2003, the Government of Uganda has produced a draft food and nutritional policy (UNFNP 2003). However, there are some programmes, plans and acts that have been contributing to the management of food security. Concerning food security innovations, several policies have been enacted to complement the situations. These include National Agriculture Policy, Forestry Policy, National Environment Policy, Gender Policy and the Land Policy. Governmental institutions are working with Ugandan scientists, institutions and farmers to help Uganda develop long-term solutions to food insecurity. Food security is still hampered by poor policy implementers, while there is increased global population and continued trends in consumption, diet and food waste. The paper tried to discover the major causes of policy failure in Uganda. The central question is "what policy failure remedies can promote structural transformation of food security strategies in Uganda"?

1.2. Statement of the Problem

Food security in Uganda has over the years been largely organised at all social and institutional levels where what was produced is consumed and the surplus used as source of income. Though the country had been self-sufficient in food supplies, literature shows that there still exist gaps of occasional food shortages subsequent to bad weather and poor harvest, instability and conflict, natural disasters and other factors. Even in areas with food-secure communities, surplus food is sold off to satisfy competing socioeconomic needs, leaving them vulnerable to food insecurity. Overall, the food security implementation challenge may not be visible at national level; but is a reality at the village level.

Food security policies are usually enacted to overcome hindrances brought about by poor management of resources. Food security has been identified as an environmental problem linked to soil and water degradation, hence low farm productivity. Food security policies are usually formulated and designed as standard guideline to governmental institutions and communities they impact on, especially on the resources that are either misused or overused by the end users. Several feasible policies, as far as food security innovations are concerned, have been enacted by the

Government of Uganda, and are followed through legal and the regulatory frameworks, which are usually designed in favour of supporting food security at household, local, national and regional levels. However, most of the food security policies promoted by the Government of Uganda, geared towards increasing household incomes, by increasing the agriculture production, are contributing to productivity reduction. The food security policy dilemma shows that failure to implement adequate policies is not putting in place procedures and processes urgently needed by the communities. Both the government and the community fail the social and institutional food security innovations. These policies fail to take off or take longer time and continue to be major challenges to the sustainability of food security innovations.

The research paper aimed at discovering the policy implementation gaps facing Uganda's food security. It attempted to address the following specific issues:

- food security institutional innovations;
- the major policy implementation failures in Uganda's food security policy;
- perception on the causes of social and institutional innovation failures in Uganda; and
- recommended strategies that can hinder poor policy implementation in Uganda.

1.3. Methodology

The study was based on the empirical procedures that have been applied in districts implementing food-security-related policies in Kigezi, South-western Uganda. The Kigezi Highlands extend across four districts: Kabale, Kisoro, Kanungu and Rukungiri. The study is qualitative in nature, involving the use of semi-structured interviews and questionnaires administered to policy implementers. The observation frame was to capture visible data on different promoted institutional innovations in relation to the success and failures of the policy. These tools were used to identify failed food-security-related policies enacted by the Government of Uganda. Sixty (60) respondents were purposively selected from each district. They were interviewed in order to obtain a cross-section of views of respondents from different backgrounds. These included forestry officers, agricultural officers, fisheries officers, environment officers (former), National Agriculture Advisory Services NAADS¹ coordinators, district councillors, community development officers, sub-county chiefs and local councillors (LC)² at different levels from LC1 to LC5 chairman. More so, they were purposively selected due to the nature of work as far as sustainable institutional frameworks are concerned. The study involved as respondents government representatives who are the major policy and decision makers at district levels, acquainted with the government policies in Uganda. The respondents participated in promotion of institutional innovations planning,

organising, monitoring, controlling, allocating funds, budgeting and mobilising resources to implement government policies. Quantitative data was organised and analysed using Statistical Package for Social Sciences (SPSS). Some of the findings are presented in form of tables and figures for ease of comparison and analyses. The findings were supplemented by qualitative data derived from respondents.

1.3.1. Validity and Reliability of the Instruments

The researcher pilot tested the instruments to ensure their validity and reliability. In so doing, the researcher, under the guidance of the Organisation for Social Science Researchers in East Africa (OSSREA), was able to improve effectiveness of the instruments employed (questionnaire, interview guides and observation guide). The items within each instrument were thematised in advance so as to acquire relevant data for the study.

1.4. Organisation of the Paper

This paper presents major theories on which the study is based. Theory of change, the functional theory and the Malthusian theory in respect to food security are elaborated. The conceptualisations of issues concerning government policies promoting food security variables are presented. Themes on food security innovations, policies, major failures in policy implementation, causes of the policy malfunction are investigated. Different variables on food security policy implementation are addressed. Literature on policies favouring food security are discussed. The results stating the perceptions on the causes of the policy failures in and possible strategies to overcome them are presented. Therefore, the study focuses on the reasons why the implementation of some social and institutional innovations failed in Uganda. Data analysis, presentation, discussion follow. Lastly, conclusions and recommendations are drawn on the bases of the findings.

1.5. Justification of the Study

The rationale of food security by Uganda government within national priorities is very important. This is analysed within the consent of the current policy frameworks, such as Poverty Eradication Action Plan (PEAP)³, Plan for Modernisation of Agriculture (PMA), Draft Food and Nutrition Policy and other related sectoral policies. Implementation of food security policies and innovations in Uganda still require the enhancement in the use of low technology, agricultural tools and over-dependence on rain-fed agriculture. These are coupled with lack of market information, inadequate finance, poor feeder roads, poor storage and processing facilities, and inadequate buffer stocks, which contribute to some of the constraints in making food available in parts where there are shortages. As far as food production is concerned, the study findings will check the implementation challenges that bring about poor yield, poor infrastructure that still contribute enormously to food insecurity in Uganda. The general policy framework in Uganda is another factor, which has direct relevance

to food security given the level of both political and financial commitment at the national level.

Most food security policies are recommendations by the International Monetary Fund (IMF) and World Bank. They are meant to cutback government support to the agricultural sector, abandoning storage facilities, liberalisation of the agricultural sector and cutting off most of the support needed by the farmers to boost production and storage facilities.

This study will generate useful information on the subject in which only partial research has been carried out in Uganda.

The social and institutional frameworks on food security will promote the importance of considering innovations and moving toward approaches that resolve the challenges in the implementations in food security.

The Kigezi region in South-western Uganda is a high potential agriculture production but facing the challenge of high population density of 300 persons/km², but a growth of just 2.2% per annum (Ministry of Finance, Planning and Economic Development— MFPED 2008). The region is faced with erratic and extreme food insecurity challenges which, coupled with environmental degradation, have accelerated decline in land productivity in many parts of the region.

The region faces several food insecurity challenges and absence of innovations due to inappropriate policy implementation.

2. Theoretical Framework: Theories Related to Food Security Policy Implementation

2.1. Theory of Organisational Readiness for Change

Weiner (2009) comments “Whenever there is change implementation and change resistance, there should be usually organisational readiness for change”. In organisational construction at all levels, readiness for change refers to organisational members’ shared resolutions to implement a change (change commitment) and shared belief in their collective capability to do so, leading to change efficacy. This is in line with food security policy and their failure to implement. There is a need to prepare for change of the policy at hand so as to avoid change resistance. Most of the adopted food security innovations are not prepared for. National Agricultural Advisory Services (NAADS), for example, failed due to unpreparedness of the food security policy implementers. They ended up messing the whole programme, hence causing dismissal of the policy implementers and some food security innovative programmes. Now, the programme is run by government soldiers, the success of the programme is thus questionable.

On the other hand, communities’ adoption to new innovations is usually a challenge. The local communities are usually accustomed to indigenous interventions; improved innovations usually require training, acquiring new

skills, and are time consuming. These impose resistance in the adoption of improved innovations. Therefore this theory supports the existing puzzle in implementing security innovations.

2.2. Theory of Effective Change Implementation

Effective change implementation, according to Kurt Lewin, should target group norms first and then focus on individual behaviours (Spector 2007). People will become more committed to implementing solutions if they have been involved in the problem-solving process, participatory approach to policy implementation. The top-down approach has been common method for policy implementation by social and institutional innovations, to achieve a sustainable food security in Uganda. The introduction of the decentralisation policy, which checked the participation of the beneficiaries in different interventions, is a recent phenomenon. Therefore, if the food security innovations are to be adopted, the implementers should be involved in the formulation and decision-making of the policy for sustainable food security.

2.3. The Malthusian Theory

The theory proposes that population of a country is limited by the means of survival, mainly the inadequate availability of food. Malthus thought that the law of diminishing returns operated in the field of agriculture and that the operation of this law prevented food production from increasing in proportion to labour and capital invested in land. This theory elaborates the challenge of the food insecurity as the population increases. The implementation of the policy becomes a challenge because of the means in which the population is surviving for fitness in the surrounding environment, according to Population and Natural Resources Module (2011).

As far as the theories are concerned, despite the high stakes in policy implementation, potential implementation problems in policy initiatives rarely receive sustained, systematic, detailed and visible attention before a decision is made on those initiatives. In part, this is because there is no simple and generally accepted methodology for performing such an analysis that falls within the skill set of a single profession and that can be reduced to a single indicator which policymakers can use (or abuse) easily. In part, as will be discussed below, it is because politicians supporting a program have few incentives to point out potential implementation problems during the legislative process. To address these problems, this issue briefly lays out a set of common policy implementation problems that can be observed in a wide range of policy sectors, as well as a framework for organising a systematic implementation analysis and a set of potential strategic responses to implementation problems identified by that analysis.

In contradiction, theories concerning political instability, unfavourable ecological imbalances like climate change, low technology adoption, pests and diseases, corruption are not in line with the inadequacy of policy

implementation. Still non-implementation policy hindrances would exist in the social and institutional innovations for achieving sustainable food security.

2.2. Conceptual Framework

The study was guided by the conceptual framework showing the interactions between the dependent and independent variables (Figure 1).

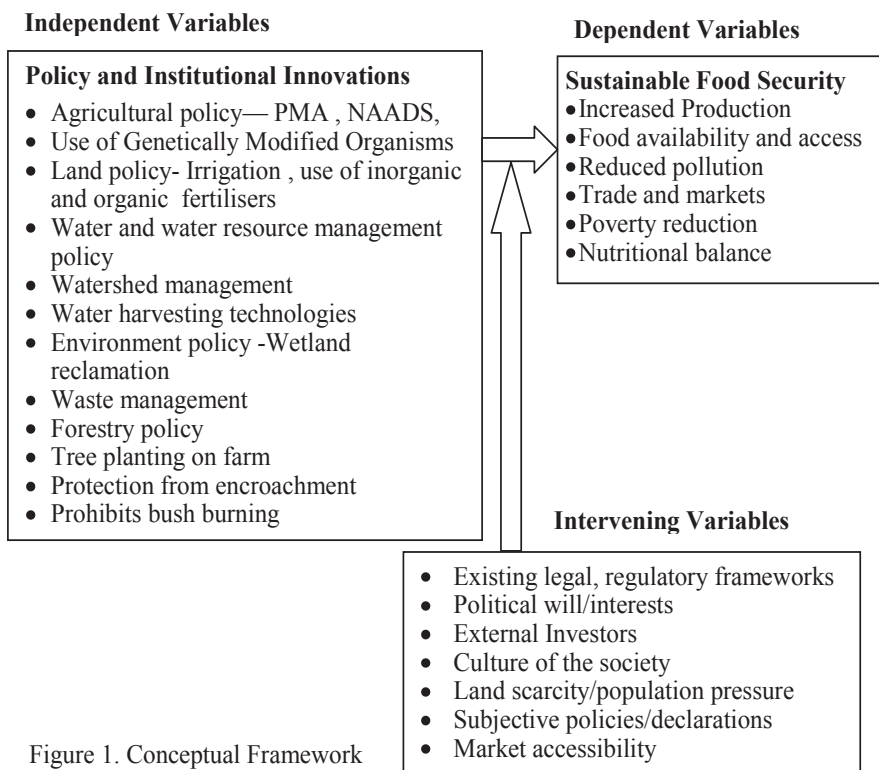


Figure 1. Conceptual Framework

SOURCE: Generated by the author

Most government policies Uganda were enacted after the 1989 National Resistance Movement (NRM)⁴ took over power. Therefore, this study will take into account those policies related to food security from then upon to date. The major ones are: the agricultural, environmental, forestry, land, decentralisation and gender policies addressed at the national level. These policies elaborate the food security innovations proposed for implementation. Independent variables are explored and effects on dependent variables shown. These are the outcome of successful food security innovation strategies that lead to sustainable food security in Uganda. The intervening variables show how, despite the implementation of the policies, several other aspects may contribute to, and impact upon,

the non-implementation of the food security strategies, which were meant to be innovations.

2.3. Social and Institutional Frameworks for Food Security Innovations

It is very important to attach the social and institutional innovations for achieving sustainable food security to the Ugandan government as a national priority. Such a lens should be applied to the current policy frameworks, such as Poverty Eradication Action Plan (PEAP), Plan for Modernisation of Agriculture (PMA), Draft Food and Nutrition Policy and other related sectoral policies.

Sectoral roles have been identified in the proposed National Food and Nutrition Strategy (NFNS), indicating the lack of resources needed for implementation. In spite of the existing opportunities in the form of right to food, relevant institutional and policy frameworks, non-state actors may provide the necessary momentum and impulse to empower rights holders to demand accountability from the duty bearers on matters of social protection and safety nets needed to remedy hunger and malnutrition in Uganda.

The Uganda Food and Nutrition Policy— UFNP (2003) elaborates on its associated strategies that have been formulated in the context of the overall national development policy objective, which are to eradicate poverty as detailed in the Poverty Eradication Action Plan (PEAP). This is important given that poverty is one of the determinants of malnutrition, hence food insecurity. In addition, the policy is in line with the Plan for Modernisation of Agriculture (PMA), which seeks to ensure food security, create gainful employment, increase incomes and improve the quality of life of the rural people. The policy is also in the line with other national policies, including the National Health Policy, Vision 2025, National Gender Policy, Population Policy, National Plan of Action for Children, the Decentralisation Policy, Universal Primary Education and Environment Policy. The policy and its strategies comply with international treaties, conventions and resolutions to which Uganda is committed.

In addition to the GoU (2003), the Ministries of Health (MoH) and Agriculture, Animal Industries and Fisheries (MAAIF), which are the lead ministries in food security and nutrition issues, are mandated by the Constitution to set minimum standards, assure quality and develop relevant policies. Under the UNFS, the specific mandate of the MOH is to improve the quality of health services and to ensure equity in accessing essential health services with the overall goal of reducing morbidity and mortality. Nutrition is one of the priority components of National Minimum Health Care Package being implemented under the Health Sector Strategic Plan. The overall food security mandate led by MAAIF is to support, promote and guide the production of crops, livestock and fishery so as to ensure the improved quality and quantity of agricultural produce and products for

domestic consumption, nutrition, food security and exports. MAAIF and MOH are also promoting diet diversification as well as other food-based strategies for a healthy and productive population; but, MAAIF is the lead institution to innovations in achieving a sustainable food security.

Furthermore, the issues relating to food security and nutrition are multi-sectoral, involving both public and private stakeholders, according to (GoU 2003). In order to co-ordinate the various stakeholders, the Government established in 1987 the current National Food and Nutrition Council (NFNC). The NFNC also has the function of advising the Government on the formulation of the UFNP, providing guidelines on the implementation of the policy, research, monitoring and evaluation. (see Figure 2 for the Structure of the Institutional Framework).

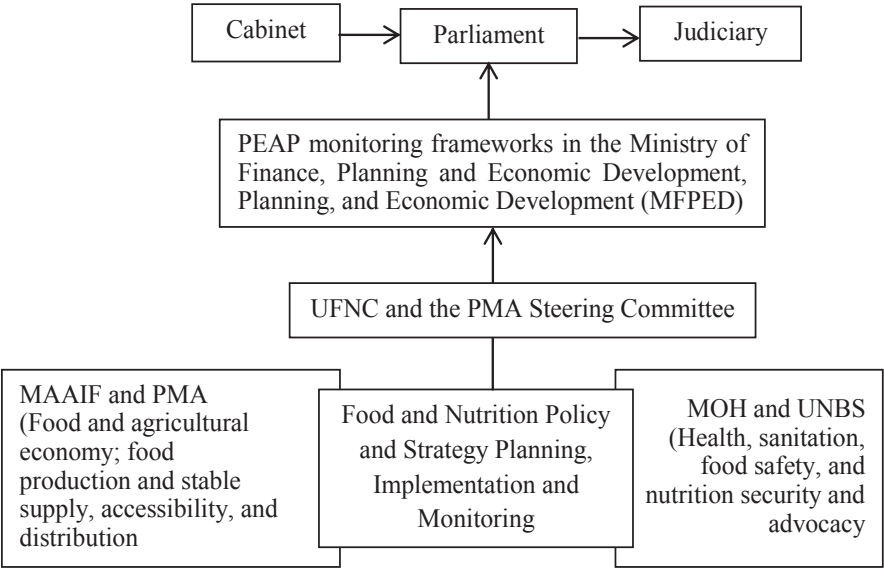


Figure 2. Institutional Framework Supporting the Right to Adequate Food in Uganda

SOURCE: Adopted with modifications from Rukundo (2008, 2007)

Note: All sectors and Civil Society Organisations (CSOs) are represented on the Uganda Food and Nutrition Council (UFNC). The Sectors include the Ministry responsible for Agriculture; Ministry responsible for Finance, Planning and Economic Development' Ministry responsible for Local Government; Sector Board; Sector Secretariat; District Local Governments; Sub-County Local Government; Farmer Forum and Institutions; Private sector service providers)

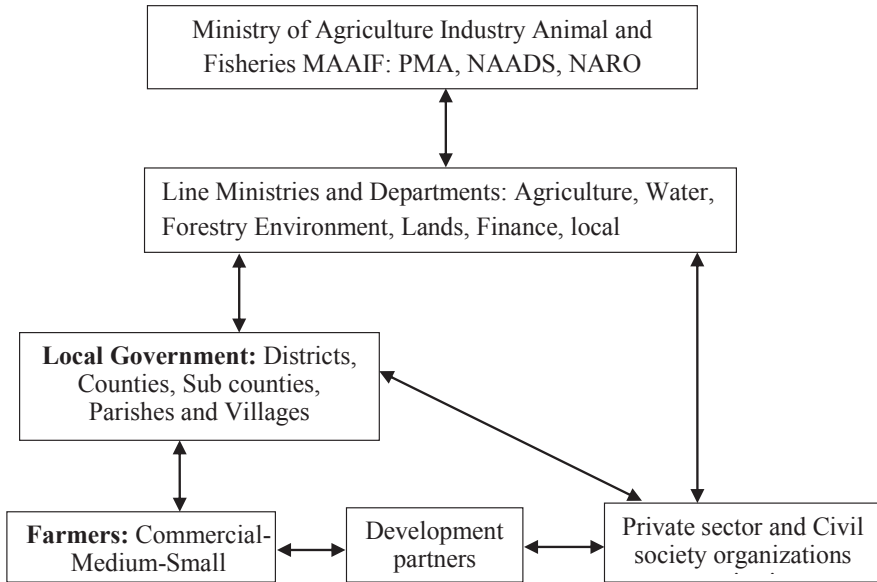


Figure 3. Institutional Innovations Implementation Framework for Food Security in Uganda

SOURCE: Sketched by the Author

The first part of Figure 3 presents the sequencing of actions in 4 main phases, beginning with the activities that need immediate action for implementation. The second section gives the co-ordination mechanism for the PMA to ensure that all relevant ministries and other key stakeholders are kept on board during implementation. The third section proposes a monitoring mechanism to track the progress of PMA implementation. The fourth is a schema for tracking the operationalisation of the food security innovations usually introduced to sectors or ministries responsible later developed for sub counties to empower the grassroots financially and thereby enhance planning and budgeting at the sub-county production committees but under the overall guidance of the central government through, for example, the PMA Planning and Financing Forum.

The institutional arrangements support the implementation of the institutional innovations to achievement of food security. For example, the PMA supports capacity building of local governments to plan strategically and in PMA-compatible manner. Sector ministries are also supposed to be supported to strengthen their capacity for food security strategic planning, policy formulation, resource-constrained budgeting, provision of technical back-up to local governments and private sector institutions for monitoring the PMA.

2.4. Institutional Innovations for Achieving Food Security

FAO (2008) provides a useful discussion of the basic concepts on food security, including vulnerability of the people in the community. People who are already poor are vulnerable to hunger, because they lack the resources to meet their basic needs on a daily basis. Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Within this definition of food security, there are three components that need to be put into consideration— these are: availability, access and utilisation of food according to (FAO 2002).

The availability refers to the adequate quantity, quality and seasonality of the food supply in affected areas. Access refers to the capacity of a household to buy sufficient food to satisfy the nutritional needs of all its members. It is a measure of the household's ability to acquire available food during a given period whereas utilisation refers to a household's use of the food to which it has access, including food storage, processing and preparation as well as its distribution within the household. It also refers to an individual's ability to absorb and metabolise nutrients (FAO 2005).

Food security has a vital contribution to the world's food and agricultural economy and to its national food security results from the small-holders' responsiveness to public policies and to national investments in agricultural research, development and in public infrastructure. Thus, the current decline in public investment in these critical public goods raises much concern for future agricultural growth. There are strong and urgent needs for policy interventions to reverse these declining trends of public investment in agriculture and its infrastructures (Singh, Kumar and Woodhead 2002)

The policy implementation issues have to do with agriculture, land, environment, water, and decentralisation. Gender is at the heart of food crises and food-related emergencies. It is an underlying cause of malnutrition and mortality, and a significant factor in longer-term livelihood security. Food insecurity may cause irreparable damage to livelihoods, thereby reducing self-sufficiency. It is, therefore, part of the process leading to malnutrition, morbidity and mortality. In addition, the state of being food insecure directly contributes to destitution and damaged livelihoods in the long term explained by Young *et al.* (2001). The policy should then look at the increased production, food utilisation, availability and access, reduced pollution, trade and markets, poverty reduction, and nutritional balance. External forces are likely to be considered, too. The existing legal and regulatory frameworks, political will, external investors, cultural barriers, land scarcity/population pressure, subjective policies/declarations, market accessibility are proactive in policy implementation.

3. Policy Implementation Analysis for Sustainable Food Security

This presents analysis of major policy implementation strategies towards achieving food security. It elaborates the policy implementation strategies, their challenges and the remedies to accomplishment and proper execution of food security frameworks.

3.1. Government Policies Related to Food Security

3.1.1. The National Agricultural Policy (NAP) 2013

The overall objective of the agriculture policy is to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable agricultural growth (NAP 2013). The Policy has developed several strategies promoting food security through poverty reduction in Uganda. The Government strategies and operational frameworks have ventured to implement the Plan for the modernisation of Agriculture (PMA)⁵ and National Agricultural Advisory Services (NAADS).

PMA is one of the implementation strategies under the study policy as far as food security innovations are concerned. It specifies guaranteeing food security through the markets and improved incomes, thereby allowing households to specialise, rather than through household self-sufficiency. National Agriculture Advisory Services programme under the policy formulated to strive to promote efficient extension services primarily capitalises on private sector service delivery. The services are meant for the smallholder poor resources farmers, hence increased productivity and value addition, providing employment opportunities, and promoting domestic and international trade (GoU 2000).

The policy had several implementation strategies that have not been achieved yet it states, that it shall be implemented by the Government of Uganda through the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)⁶, other related ministries, departments agencies, the private sector, farmers and farmers groups, civil society organisations, and development partners (NAP 2013).

According to NAP (2002), the policy highlights some of the challenges of policy non-implementation, especially at the different stages of the commodity value chain. These included low production and productivity, low value addition to agricultural produce, lack of sustainable or dependable access to markets, failure to maintain a consistent policy regime and functional institutions. There is also insufficient skilled agricultural labour force, high human disease burdens and inadequate attention to the sustainability of natural resources.

3.1.2. National Environmental Management Policy (2002)

The National Environmental Management Policy provides the framework to guide these actions and is the cornerstone of the country's commitment to social and economic development that is environmentally sustainable and which brings the benefits of a better life to all Ugandans. The major strategies that have failed include the following.

- **The Strategies to Improve Water Resources and Wetlands⁷ Management (NEMA 2008):** The policy highlights the importance of wetlands arising from the fact that they provide socio-economic and ecological values and functions. However, wetlands are currently threatened with degradation as a result of being drained mainly for agricultural production, brick-making and industrial expansion. This strategy was meant to promote the conservation of wetlands, to sustain their ecological and socio-economic functions for the well-being of the present and future communities. This applies to sustainability of food security in the area. However, it states that wetlands are experiencing threatening human actions (anthropogenic pressure) and natural phenomena such as climate change and climate variability and structural limitations. The human action includes population growth, drainage of wetlands, and industrial and municipal waste discharge. The natural ones are instances like floods, landslides, extreme wet and dry weather to mention a few. Structural policies include funding and the capacity for service in the implementation of food security innovations. The maintenance and resources for backup are also not enough to promote food security.
- **The Pollution Control Strategy:** This was enacted in 2006 and even now the government is trying to ban the polyethene, which is a major challenge to soil and water conservation. Waste management, especially poor polythene materials management, has escalated because of the increasing size of the population, inadequate and poor waste management infrastructure, lack of personnel and resources needed for proper waste management, poor practices of waste disposal, and repeated outbreak of diseases. NEMA (2008) highlights that all these happen because towns and municipalities lack funds to facilitate the procurement of equipments, disposal facilities and other capacity, in turn affecting implementation of the food security strategies, putting into dilemma the prospects to achieve food security.
- **Bush Burning Strategy** for the same is being handled by National Forestry Authority (NFA)⁸, the District Department on Natural Resources Management according to (NEMA 2006). This strategy needs a careful consideration because it has high impacts on food security as bush burning causes soil nutrient loss, thereby leading to decline of crop yields and affecting food security. The policy is faced by challenges leading to regular loss of biodiversity. This policy is one of the outdated policies on land management, cattle grazing act and soil

conservation. It needs to be harmonised with recent policies in order to operate well. This has been challenged by poor monitoring system, free range grazing and bush burning which is out of control.

- **Fisheries Policy (2004):** According to the Fisheries management, districts, departments and agencies, other aquatic resources constitute an important resource and contribute greatly to the nutritional welfare of the people while providing employment and livelihoods to thousands of people. This policy aimed at ensuring the quality and availability of fish for food security. It also contributes to poverty alleviation and income generation. This sector also makes significant contribution to the national economy. Unfortunately, fisheries and other aquatic resources are threatened by introduction of exotic species, pollution of the water bodies, and over-exploitation, among others. The involvement of the local community in policy implementation is essential for effective management of the fisheries resources.
- **The Ugandan Forestry Policy (2001):** The Policy Statement ⁶ stresses on farm food security. The strategy for implementation states, “The government will promote and support farm forestry in order to boost land productivity, increase farm incomes, alleviate pressure on natural forests and improve food security”. It is also stated in the National Forestry Plan (NFP)¹⁰ (2002). This emphasises the importance of farm for food production at household level. However, the policy has several challenges that impede its implementation. There is a lot of tree cut on farm in search for forest products (MWLE 2013). There is also the introduction of cash crops like coffee, tea, pine and eucalyptus plantation for income generation which have decreased tree planting on farm.
- **The Policy Statement ⁸ on Watershed¹² Management and Soil Conservation** is similarly supposed to address the problem of environmental degradation. In relation to food security, the strategy for implementation states that “There will be promotion of the rehabilitation of degraded forests in watershed catchment areas and bare hills through private, community and farm forestry”. Watersheds are useful and crucial agricultural areas where most communities derive food and these are the most fertile fragile areas. These other strategies were to develop accompanying regulation to the provisions of the National Environmental Statute (2005) and Water Statute (1995) that consider soil conservation and the protection of riverbanks and lakeshores.
- **Land Policy (2013):** The land policy is one of the major strategies that impact more on food security. UNDP (2005) presents how the land policy is presented for recognition of the Rio Convention. It emphasises the alleviation of the effects of drought and desertification under the programme of Convention to Combat Desertification¹³ (CDD). There are major challenges related to the different land tenure systems

existing in Uganda as well as the emerging risks of land fragmentation occasioned by poor inheritance of property practices. The large populations have also contributed to the systematic exploitation of soil resources that lead to soil fertility deterioration. The other challenge is the population pressure that has pushed farmers to use shortened fallow periods, hence cultivating fields without resting. Sustainable use and management of agricultural resources is an objective of this policy, which is fundamental to future development of the agriculture sector. The overall objective of the land strategy under the agriculture policy is to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable food security (NAP 2013).

- **National Gender Policy (1997):** A comprehensive National Gender Policy was formulated in 1997 under the auspices of the Ministry of Gender, Labour and Social Development (MOGLSD). Women are the major participants in of agricultural activities; thus providing food security and proper livelihoods to our community. This policy is meant to mainstream gender issues and concerns the national development process in order to improve the social, legal, political, economic and cultural conditions of women in particular (GoU 2000).

Women face many obstacles in their efforts to promote food security. One of the obstacles is the inaccessibility to large numbers of women of useful resources; this situation is often leading to the destruction of the natural resources in search of food and the survival of the families due to overgrazing, overharvesting of land resources and deforestation in search of fuel wood. More so, women face challenges of indoor air pollution from cooking fires and the burning of bio-mass, the carrying of heavy loads, unsafe water supplies and inadequate sanitation.

The policies applied may fail at the implementation phase because of their incapability to respond to environmental challenges like lack of resources, financial credits, information, agricultural inputs, new energy saving technologies and technical assistance. They, in most cases, have no rights to land ownership even when they may be the principal farmers. Their education and training is often neglected, which is a threat to food security.

According to GoU (2002), women in Uganda are generally unable to own or inherit land due to restrictive practices under customary land tenure. Nor are they economically well-off to purchase land rights in the market. In general, customary practices in some areas of the country continue to override statutory law in recognition and enforcement of women's land rights, lessening unnoticed land grabbing at family level. This is a big constraint to food security since they are the major contributors to agriculture.

Policy implementation has become a constraint to realising food

security as far as different institutional interventions by governmental organs are concerned. These challenges, drawn from different functional institutional levels, are tremendously aggravated by unchecked governance systems, inadequate monitoring strategies, corruption, poor production and marketing strategies, technology adoption and dissemination approaches, funding and allocation of funds to mention a few (GoU 2000).

The foregoing discussion has highlighted the major constraints met during the food security policy implementation. Many gaps between views concerning food security have been identified in the course of communication with food security policy makers.

3.2. The Major Failures in Food Security Policy Implementation in Uganda

The policies are usually implemented under programmes, plans and acts and sometimes designed according to operational frameworks. The respondents referred to food security-related policies to programmes, plans and sometimes action points (Table 1). Several innovations to achieve food security have been suggested; but few are implemented. Policy-makers were requested to rank the major food security policies that affect the society mostly.

Table 1. Food security policies in order of their implementation failure

Rank	Policy and programme implemented	Innovations for food security	Constraints to/from the community
1	Plan for the Modernisation of Agriculture (PMA)	• Food processing and preservation • Genetically modified organisms	• Lack of advisory services • Resistance from Indigenous knowledge • Market failures • Transportation
2	National Agriculture Advisory Services (NAADS)	• Advisory and information services to farmers • technology development and linkages with markets	• Favours the wealthier families • Distribution of fake breeds • Services not delivered in some areas • Inadequate technology transfer
3	Water and Water Resources Management	• Water catchment protection • Promoting rain-water harvesting and conservation for agricultural production; • Water quality decline damaging aquatic life and human health and	• Lack of funds to compensate the farmers • No alternative land equivalent production • Inadequate monitoring systems

Rank	Policy and programme implemented	Innovations for food security	Constraints to/from the community
economic enterprises			
4	Waste Management (Polyethene production)	• Soil waste management in urban areas • Identifying technological issue for example recycling wastes	• Pollution of rivers, soils, water and the air • Soil blockage infiltration • Accumulation of polyethene different sites • Flooding and siltation on river band
5	Forestry Resources Management	• Promotion of on-farm forestry • Conservation of biodiversity and ecosystem services • Unsustainable harvesting	• There is less planting trees on- farm • Encroachment on the forestry resources • Permits to harvest the forests • Leasing land to community
6	Wetlands management	• Reduction on wetlands encroachment • No excavations in form of sand ,clay and brick	• Clearing of steep lands leading to • Landslides • No land cover • High population pressure
7	Food Security and Nutritional Policies	Adequate food and nutrition is a right	• Lack of sensitisation • Lack of funds
8	National Gender policy Modified organisms	Adopting gender-sensitive and energy-saving technologies and designing relevant programmes to achieve increased production with less lab our input	• Less productive organisms • Reduced yields • Big difference from the original breeds
10	Fisheries management		• Harvesting of immature • Use of non- recommendable fishing equipments • Over harvesting using inappropriate nets
11	Decentralisation Policy	Bottom up policy where services are nearer to the people	• No major challenges • Corruption • Proper planning and budget allocation

SOURCE: Field data (2014)

Table 1 shows how the majority of the policies being implemented by the Ugandan Government have impacted on the livelihoods of the community. Many failures are faced during the implementation process, creating gaps and contributing to failure of policies. The failures are bi-directional. The policy failures are usually brought about by poor implementation and at times by problems from the side of end users. For example, NAADS programme was an inappropriate policy due to improper procedure of its implementation. The community was unable to adapt to the policy, because of food insecurity that brought about several misunderstandings. It usually favoured the wealthy households, whereas as it was meant for the poor households. There was also a lot of embezzlement of funds as already predicted in the PMA government strategy and operational framework (GoU 2000).

On the contrary, some communities fail policies. It is usually taken for granted that once policies are enacted, they have to work whatsoever. This is not the case, for example, with the solid waste management policy which has failed due to communal resistance to adaptation of the requirement, especially cleanliness for hygiene purposes. Sometimes, the equipments for waste disposal are available but the method used by the community to collect and manage garbage is not appropriate. Therefore, it has been observed that those at all levels, starting from the initiators of the policy up to the end user of the policy, are responsible for policy failure.

From the findings, the policies that are not highly affected are the policies on genetically modified organisms, fisheries, the PEAP, nutrition, decentralisation and universal secondary and primary education. Several policies that affect food security were identified and ranked according to the level of policy implementation failures they faced which are ranked (see Figure 4). The major policies were watershed/land management, NAADS, tree planting, solid waste management, PMA and forestry policies.

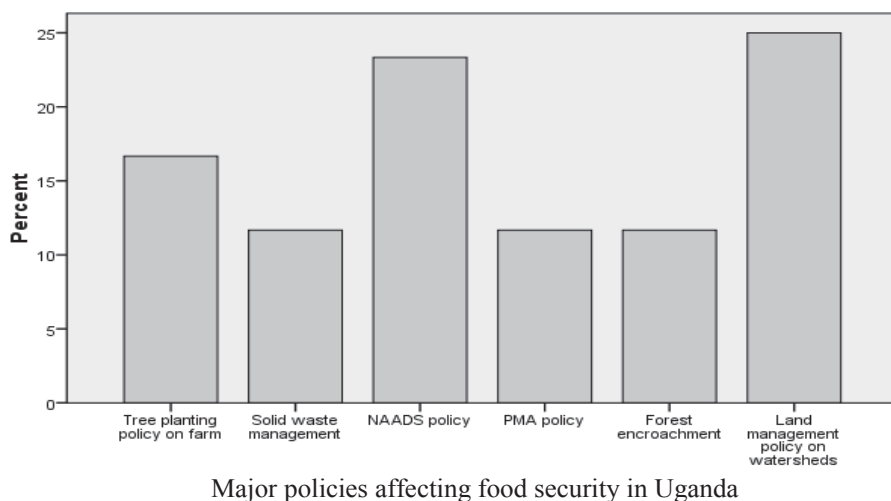


Figure 4. Responses on the Major Policies Affecting Food Security Innovations in Uganda

SOURCE: Field data (2014)

Land management policies have been identified as the major policies that have failed in Uganda (with 25 per cent), followed by tree planting policy (23 per cent) and the Agriculture Advisory Service policy (16 per cent). The rest are Solid Waste Management Policy, Modernisation of Agriculture, and the Forestry Encroachment Policy, with 12 per cent each. The failures have brought about several challenges, negatively impacting on food security in Uganda.

Land Management Policy in relation to the National Agriculture Policy (NAP 2013) elaborates how land is a major issue in the implementation of policies. Due to the increased population pressure on land, there is high scarcity of land resources that whenever a policy is suggested the issue of land fragmentation and land degradation escalates, discouraging farmers to adopt innovations/be innovative to increase farm productivity, and thus affecting food security. Farmers have resorted to cultivation of their field shortening the fallow periods (MLHUD 2013), thus leading to soil erosion and increased cases of landslide. Even though tree planting contributes to soil fertility regeneration on farm, tree planting culture in Ugandan communities has phased out in some regions. People no longer plant trees for environmental or for food security purposes. Most woodlots are planted and destroyed for timber, poles, medicine, and fuel wood production. This is in line with challenges identified with the Forestry Policy in Uganda (MWLE 2013).

NAADS Programme which deals with delivering agricultural advisory services to the farmers has been identified as a failure by the President of Uganda, Government ministries, departments, agencies and the beneficiaries. It has been suffering from unsatisfactory delivery of the envisaged services. It has been challenged by corruption, embezzlement of fund meant to purchase the agriculture inputs, marginalisation of the minority, distribution of non-improved livestock breed, and distribution of fake materials (Figure 5). All this is a setback to innovations toward achieving sustainable food security in the country.

Respondent emphasised that solid waste mismanagement is also a major challenge to urban area in Uganda. The main waste product which is a threat to food security is the non-degradable polyethene paper manufacture in Uganda whose policy was enacted but has never been implemented ever since 2006. This is a continuous challenge to food security because it affects the percolation of water into the soil, blocks water pathways and provokes flooding due to sedimentation in the ground. This is in line with the stipulation in NEMA (2002) policy that has failed to be implemented. The ban was recently announced on the 15th April 2015. Still the manufacturing industries have not stopped their production hence, failure to policy implementation.

Under the Plan for Modernisation, some programmes have been implemented; the biotechnology programme for the production of Genetically Modified Organisms (GMOs) has been rejected due to biases from the community. The local policy makers who were interviewed did not recommend the new technology saying it has impact on human health. In addition, local people prefer the local breed saying they are more nutritious compared to the improved breed. This failed the GMO policy, whereby even freely distributed improved agricultural materials like sorghum, avocado seedlings, beans, and maize were discarded.

A chair person of one of the local councils revealed, “There is a threat and fear from products not produced naturally to cause cancer. Moreover, the improved products like bananas, avocados do not taste the same as the local indigenous breed. Usually they are tasteless giving farmers doubtful thoughts.”

Lastly, the other policy affecting food security was identified as Forest Encroachment. Communities have resorted to encroaching on the forest reserves to get food, firewood, shelter and land for survival. This policy works in some areas where there is proper and regular monitoring of the reserves forests boundaries. This originates from poor facilitation and unskilled foresters to monitor these regions, hence limited human resource to work in such remote areas.

3.3. Respondents’ Perceptions of the Major Causes of Policy Implementation Failures in Uganda

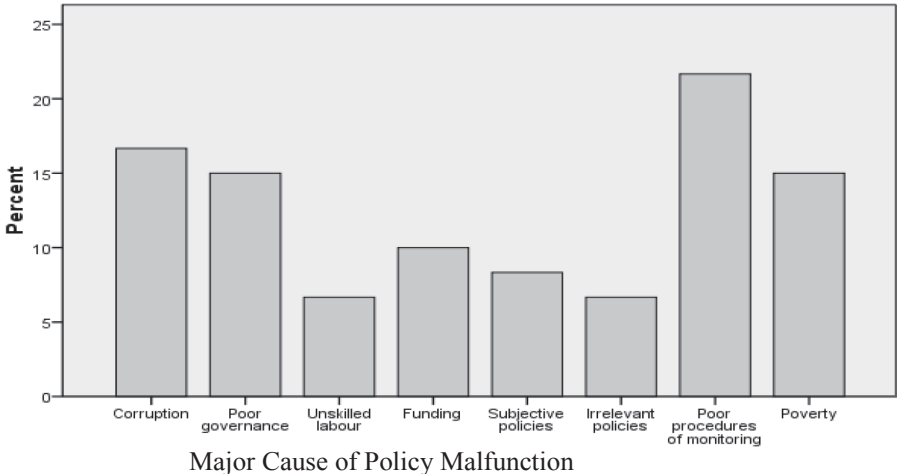


Figure 5. Percentage of Respondents with Perception of Major Cause of Policy Malfunction

SOURCE: Field data (2014)

Regarding, Respondents indicated that poor procedure of monitoring (21.7 per cent), corruption (16.7 per cent), poor governance (15 per cent), poverty (15 per cent) lack of funding (10 per cent), unskilled labour (6.7 per cent), subjective policies (5 per cent), and irrelevant policies (6.7 per cent) were the major causes of food security policy malfunction in Uganda.

As has already been mentioned, most policies are poorly executed due to lack of political will. This has aggravated failure of most food security policies though enacted by the Government. This challenge has been identified in the State of Environment Report (NEMA 2008). Usually, there are poor monitoring systems in the Wetlands encroachment. This is induced by corruption and lack of funds to reach out to the necessary areas for policy implementation. Another scenario is when extension workers are assigned in remote areas. It is hard for them to stay there because of lack of social services, thus contributing to failure of the policy implementation at local level. There is also decentralisation of food security policies where services are brought closer to the people. This policy is meant for health departments and quick agriculture income generating activities like credit and savings funding programmes.

Poverty has also contributed to the failure of some policy interventions like NAADS and PMA as far as food security is concerned. These were meant to transform people living in absolute poverty to better standards of living.

One District agriculture officer had this to remark: “The material or projects that were given to the poor could not survive due to several factors like illiteracy and unskilled labour. Long-term projects like Zero grazing, poultry, piggery growing, and Irish potato growing do not last. Zero grazing cows were given to famers without land for pasture. There is no way such a project could be sustained without resources”.

Lastly, government has always introduced irrelevant food security programmes and also ascribed some policies to communities when those policies were not viable as was the case with the introduction of a project “Donkey for Labour” interventions where those members of communities were unable to survive like the climbing of steep places. The implementation analysis is not carried out to see the viability of such food security innovations, hence loss of funds and other realised expenses. The government of Uganda is facing a lot of upheavals due to poor policy implementation. This has always resorted to more food security challenges in the end.

There are gaps on food security challenges that have been identified though not presented by the district policy makers that need serious attention when it comes to food security policy implementation. These are uneven monitoring in some policies across different regions, poor and missing information or data for particular issues. There is also lack of evidence and continual reporting of food security implementation strategies.

3.4. Potential Strategies that Can Negate Poor Policy Implementation in Uganda

Uganda has made substantial policies in food security management. However, many challenges still exist and remain unaddressed. Several policies have aimed at improving the food security situation in the country. As Ugandans become increasingly populated, several issues will arise and cause the policy questions to skew towards addressing food insecurity. The questions are: “what can be done? What are the alternative strategies for these failures?” Local-level policy makers had views of what they anticipate to be similar to the National Vision or dream of 2025 of PEAP and the agriculture-based modernisation strategy (PMA) to explicitly check the food security standard or concerns.

Unfortunately, it is difficult to assess the success and failure of implementation of food security strategies. The government representatives have, however, suggested viable mechanisms that could be adopted for successful policy implementation (Figure 6). These are public awareness, participatory approaches, and penalties for failures to adhere to international declarations.

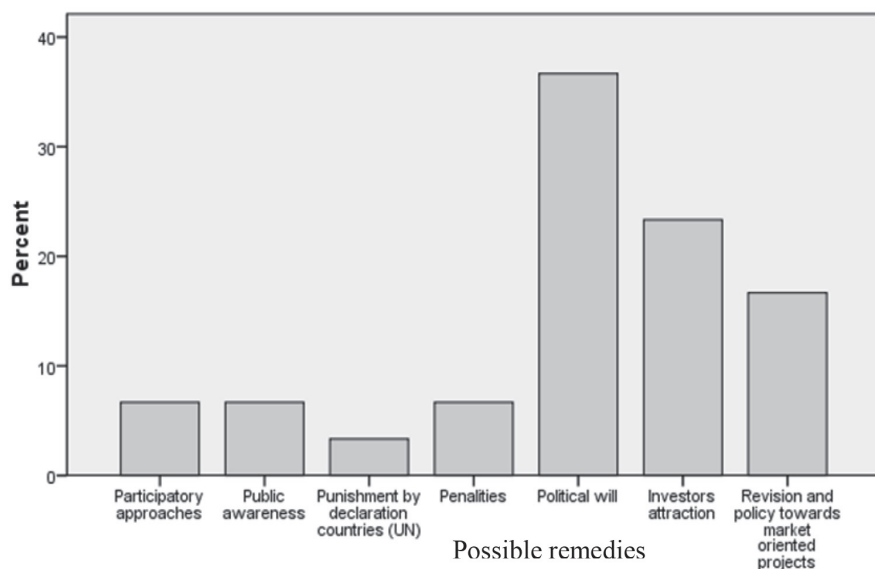


Figure 6. Possible Remedies for Food Security Policy Implementation

SOURCE: Field data 2014

Figure 6 above explains the views of policy makers regarding the potential strategies for improving policy implementation. They presented political will (36.7 per cent), good investment climate (23 per cent), market-oriented policies or programme (16.7 per cent) as the most viable suggestions for adequate policy implementation. The issues to do with participatory approaches, creating public awareness, and penalties received 6.7 per cent of the responses each and punishment on failure to adhere to multi-national declarations (3.3 per cent).

There are viable mechanisms of supporting the implementation of policies, to increase the productivity of Uganda's agricultural system. One of the most significant solutions is the political will of the government. If it supports a certain policy, nothing can stop it from being implemented because of the availability of all resources like funds, market and human resource.

The LC representatives support several issues and some had this to say.

Mr. Sam Ndaba LC Chairperson from Katuna comments that, "Indeed, political will can't fail a policy because they are the ones in power they can do anything to implement the policy. For example, a country like Rwanda has been able to adopt and implement some of our policies. Formulated policies in Uganda are not working effectively; for example, the Policy for the Elimination of Polyethylene Bags and their effect on land". This is in line with Waste Disposal Policy as highlighted in the Wetlands Management

Policy (NEMA 2008), that unless there is a political will, the policy will not work. There is need of lobbying for the food security policies to be implemented at local level by the leaders at local levels.

Good investment climate for investors and for foreign parties would attract investors to act toward achieving sustainable food security. A lot of improved technology, such as irrigation systems, improved products, and breeds from developed countries can assist in improving food security. To control corruption and embezzlement of funds, foreign investors can be part of the privatisation of some of the food security policy implementing bodies.

Market-oriented food security innovations or programmes and strategy for modernisation of agriculture, as discussed in the literature review (GoU 2002), would encourage and support the demand-driven food security innovations. These enhance immense food production not only for subsistence but also for commercialisation.

Creating awareness is crucial in policy implementation as suggested in the GoU (2002). The majority of the communities need proper sensitisation, whenever any innovation toward food security is to be adopted in a community. Subjective policies usually are not sustainable. This is in line with non-participatory approaches in policy development. The grassroots who are the implementers of the policy should be part on the team formulating the policy in order to avoid the top-down approach, which is usually limited to a few and might not be sustainable.

Sanctions and Incentive approach can provide a chance for some innovations to be implemented because of its rewards at the end of the day. The end users of the policy who do not execute what is required of them should be penalised so as to foster innovation. Concerning this issue, the Sub county Chief of Bubare Sub-county said: "Grazing is a bye-law at the local council level. It prohibits people's animals grazing in others people's fields, which deteriorates the soils, and hence reduces production. A fee of fifty thousand shilling (50,000) is paid as fine when caught". Similarly, countries that do not meet the strategy for international declarations or conventions should be removed from being representative of the declaration. For example, all representatives of the United Nations Member Countries had to comply with the Wetlands Policy under the Ramsar Convention.

Limitations of the Study

The main challenge to the researcher was suspicion of respondents. Some policy makers could not release information with the fear that, it could jeopardise their operations. This led to laxity in participating, and even hiding of information. Furthermore, local respondents thought that the researcher would betray them, which would expose them as policy implementers and stop working in their areas as a result.

Due to distance and poor road network in areas of data collection was hard as the centres were far apart. Meeting a respondent was expensive because one needed prior booking by researcher. This challenge caused costly transport and other difficulties leading to some delays. In addition, poor communication network was challenge to the researcher, where she had to sacrifice enough time for data collection. This required enough time to collect data at a slow pace.

Furthermore, this study was not funded at all. The researcher had to bear the total costs for travelling, stationary and accommodation expenses. However the researcher managed to control her challenges. The researcher was able to avail her presence in these communities. The interviews were conducted in English since the interviewees were among the elite group. Slight translation was done into Lukiga—the local language for a few Local leaders.

4. Conclusion and Recommendations

4.1. Conclusion

The dilemma to achieve sustainable food security has been identified as a global threat for Uganda's growing population. The policies enacted should warrant as security to the present enormous challenges that have hit thousands of livelihoods. Several agencies have been able to promote food security as a strategy and the agricultural sector must be recognised, and become a centre for the programmes to eradicate poverty.

The peril of implementing food security policies has hindered several sectors in economic development and drained the major sources of future growth. There have been many attributions when it comes to food security policy implementation and the reason why Uganda has escalated livelihood challenges taking place and causing stress to the population. Uganda as one of the developing countries has to review its procedure of policy identification, formulation and implementation for proper planning and economic development, if it has to be lifted to greater heights of its population welfare.

Uganda's Food Security Institutional Innovations designed under food security-related agencies such as agriculture, health, forestry, environment, water and gender ministries and departments are relevant road maps to promote sustainable food security in the region. Increased production, food availability and access, reduced pollution, trade and markets, poverty reduction, and nutritional balance are the major factors that enable a country to be food secure.

However, the study has shown that the food security policy implementation crises brought about by lack of good governance, inadequate monitoring strategies, corruption, poor production and marketing strategies, inadequate technology adoption and dissemination approaches, funding and allocation of funds to mention a few. This can be overcome by revising the

operational systems to facilitate local participation and good climate for investors, capacity building, policy interpretation analysis and effective service delivery in addition to reviewing and readjusting the existing policies to the contemporary food security strategy.

The conceptual aspects of sustainable food security should embrace institutional innovations. The Food and Nutrition Act should promote and ensure the establishment of the UFNC as an apex body for guidance and the co-ordination of all food and nutrition activities in the country and guide the government in all matters pertaining to food security.

4.2. Recommendations

According to the findings, it has been clear that Uganda's policies on food security are formulated but are never implemented due to several challenges at hand (Kiiza 2007). These are mainly land management, agriculture and agricultural advisory services policy, agriculture modernisation policy, forest resources management policy, and solid waste management. Most of these policies have failed mainly because of poor governance, corruption and poor monitoring and poverty. Therefore, in order to have effective food security strategies the Government must evolve as a basic element of policies on food security with proper coordination in the institutional arrangement among the various government ministries, departments, private sector, and non-government organisations.

Uganda's major producers and consumers of food are found in the remotest regions and possess huge potential that remains highly under-utilised. It is now that Uganda is adopting strategic objectives not only to maintain its self-sufficiency in food production but also to meet the additional requirement from various sectors. Research decisions, priorities and production strategies will promote future growth in food security through ensuring sustainable food and nutritional security.

Weaver (2010) emphasises capturing the assortment of issues for good governance that need to guide the effective implementation of food security policies and strategies through increased efficiency and efficacy in service delivery. The social and institutional frameworks should be revised. There is a need to strengthen all sectors at all levels as highlighted in GoU (2008). There is a need for institutional reforms, policy formulation and provision of regulatory services as far as food security is concerned. Currently there is no particular approved policy on food security in Uganda. The policy formulation and strategic planning will be done through decentralisation to the local level by ensuring improved coordination mechanisms between implementing agencies which usually breakdown and delay the services delivered.

There is need to carry out an interpretative analysis of the food security innovations as far as agreement on the policies being implemented is concerned. The cases of subjective policies and irrelevance need to be reconsidered, leaving the legislation open-ended for interpretation. For

example, the NAADS programme was a subjective policy that led to substantial loss of resources, time and energy.

Programme operational systems in policy implementation should be solved by applying rewards and incentives to avoid problems of policy implementers with queer behaviour. Some implementers sabotage policies intentionally that concerned regulatory organs should be on the alert.

Resource organisation and capacity issues need to be considered by carrying out realistic assessment of needed resources like finance, human resources, and technology to effectively implement the policy. This is done especially where the funds are low, labour is unskilled and improper procedures of monitoring abound due to shortage of funding as highlighted in the Wetlands policy (NEMA 2004).

Capacity building is very essential to facilitate the implementation process. There is need for training in food security policy issues specifically in the approaches used to implement such policies. The policy makers lack information on policies being promoted, hence resulting in failures like the policies that are poorly monitored and enforced. Some policy makers may be hostile and lack trust in the government in general and the program being promoted. A prey to such attitudes is the National Agriculture Plan (2013).

The dependency on implementing agencies for accountability purposes and creating a good investment climate for investors can avoid issues like corruption and political interference. Some politicians usually build a hurdle between themselves and the implementing agencies which paralyses the whole food security policy implementation process. Politicians will find it hard to intervene when the implementation is run by different persons.

There is a strongly felt need for local participation in the identification, formulation and implementation of policies. This is essential for different social, economic, cultural and environmental factors. The local people contribute to the planning process; they promote the preparation of appropriate policies and strategies. This should always be considered in the process of designing, planning, implementing and evaluating policies for sustainable food security.

Notes

1. The National Agricultural Advisory Services (NAADS) was one of the governmental programmes on Agricultural Advisory Services which was meant for outreach services to the local communities. It is one of five core programmes under the PMA. The PMA envisions that NAADS will be "A decentralised, farmer-owned and private sector serviced extension system contributing to the realisation of the agricultural sector objectives". The mission of NAADS is "Increased farmer access to information, knowledge and

technology through effective, efficient, sustainable and decentralised extension with increasing private sector involvement in line with government policy”.

2. LC is a political system of leadership represented from Village (LC1), Parish (LC2), Sub-county (LC3), County (LC4) up to District level (LC5).
3. PEAP (the Poverty Eradication Action Plan) is the government’s main framework for poverty eradication. It has a fundamental objective of Uganda’s development strategy which the government has resolved to reduce the proportions of people living in absolute poverty from the level of 44 per cent in 1997 to below 10 per cent by 2017 (GoU 2000).
4. NRM (National Resistance Movement) is a government rule that went into power in 1986 under President Kaguta Museveni.
5. PMA (Plan for the Modernisation of Agriculture) is an overarching plan for poverty eradication by transforming the Agriculture sector through the multi sector interventions mainly transforming subsistence agriculture to commercial agriculture.
6. MAAIF (Ministry of Agriculture Animal Industry and Fisheries) responsible for all the ministries related issues.
7. Wetlands are areas above 3000m; they include swamps, bogs and mire of mountainous areas. They are sometimes permanent and in some instances seasonal with vegetation made up of *Cyperus papyrus*, sedge, Typha, swamp grasses and swamp forests.
8. NFA (National Forestry Authority) is a body that manages all forestry resources in Uganda and mandates whatever strategies take place nationally.
9. Forestry Policy Statement 6 states: “Tree growing on farm will be promoted in all farm systems, and innovative mechanisms for delivery of forestry advisory services will be developed”.
10. National Forestry Plan is the sectoral plan for forest development in Uganda. The Plan was developed through an extensive consultative process. It provides a framework for implement the 2001 Forestry Plan, which sets out new policy directions.
11. Forestry Policy Statement 8 states: “Watershed protection forests will be established, rehabilitated and conserved”.
12. Watersheds are areas with high distribution of tributaries of stream in hilly or mountainous areas. They are at risk from environmental degradation of water catchment areas (MWLE 2002)
13. Convention to Combat Desertification (CCD) is a declaration under the Rio de Janeiro Conference 1992. It emphasises the alleviation of the effects of drought and desertification under the programme that was held in Rio de Janeiro. The Rio conference came 20 years after its predecessor conference in Stockholm. It gave birth to a number of international instruments that continue to provide the framework for sustainable development.

References

- Food and Agriculture Organization of the United Nations (FAO). 2008. *State of food security in the world. High prices and food security threats and opportunities 2008 by the Food and Agriculture Organization of the United Nations*. Rome, Italy: FAO.
- . 2005. *The state of food insecurity in the world 2005: Eradicating world hunger. Key to achieving the Millennium Development Goals*. Rome: FAO.
- . 2002. *State of food security in the world. Where people must live with hunger and fear 2002 by the Food and Agriculture Organization of the United Nations*. Rome, Italy: FAO.
- GoU. 2013. Ministry of Agriculture, Animal Industry and Fisheries. 2013. Kampala: The National Agricultural Policy (NAP).
- . 2008. *Plan for modernization of agriculture: Eradicating poverty in Uganda (Government Strategy and Operational Framework)*. Kampala, Uganda: GoU.
- . 2003. *The National Food and Nutrition Strategy*. Kampala: Ministry of Agriculture, Ministry of Health, Animal, Industry and Fisheries. November 2005.
- . 2002. *Eradicating poverty in Uganda: Government strategy and operational framework*. Kampala: The Republic of Uganda.
- . 2000. PMA Secretariat (March 2005) Plan for Modernization of Agriculture Progress Report. Ministry of Finance, Planning and Economic Development.
- Kiiza, L. 2007. *Four big public policy challenges for Uganda. 'Policy design and implementation in developing countries'*. National Graduate Institute for Policy Studies (GRIPS), Tokyo.
- MFPED. 2008. Background to the budget 2008/09. Ministry of Finance, Planning and Economic Development (MFPED), Kampala.
- MWLE. 2013. *National Forestry Plan*. Kampala: Directorate of Environmental Affairs, Ministry of Water and Environment.
- . 2002. *National Forestry Plan (NFP). Ministry of Water, Lands and Environment*. Kampala: Ministry of Water, Lands and Environment.
- NEMA. 2008. State for environment report for Uganda 2008. National Environment Management Authority (NEMA), Kampala.
- . 2006. State for environment report for Uganda 2006. NEMA, Kampala.
- . 2004. State of environment report for Uganda 2004. NEMA, Kampala.
- . 2002. State of environment report for Uganda 2002. NEMA, Kampala.
- NFNS. 2003. *The National Food and Nutrition Strategy*. Ministry of Agriculture, Ministry of Health Animal Industry and Fisheries. November 2005.

- Population and Natural Resources Module. 2011. Conceptual framework. AAG Centre for Global Geography Education Content. Date last modified: September 18, 2011.
- Rukundo, P.M. 2008. *Institutions, legislation, policies and programmes supporting the right to adequate food in Uganda*. Kampala.
- Rukundo, P.M. 2007, *A role and capacity analysis of actors in the progressive realisation of the human right to adequate food in Uganda*. Akershus University College (AUC).
- Singh, R. B., P. Kumar and T. Woodhead. 2002. *Smallholder farmers in India: food security and agricultural policy*. FAO. Regional Office for Asia and the Pacific. Maliwan Mansion, 39 Phra Atit Road. Banglamphu, Bangkok 10200. Thailand.
- Spector, B. 2007. *Implementing organizational change: Theory and practice*. Upper Saddle River, New Jersey: Prentice Hall.
- United Nations Development Programme (UNDP). 2005. *International cooperation at a crossroads: Aid, trade and security in an unequal world*. UNDP: New York.
- MLHUD. 2013. Uganda National Land Policy. Ministry of Lands, Housing and Urban Development, Ministry of Lands, Housing and Urban Development , Kampala, Uganda: MLHUD.
- Weaver, R.K. 2010. Issues in governance studies. *But will it work? Implementation analysis to improve government performance*, The Brookings Institution 1775. Washington, D.C.
- Weiner, B.J. 2009. A theory of organizational readiness. Department of Health Policy and Management. Gillings School of Global Public Health, University of North Carolina Chapel Hill, Chapel Hill, North Carolina, USA.
- Young, H, S. Jaspars, R, Brown, J. Frize and H. Khogali .2001. *Food-security assessments in emergencies: A livelihoods approach*. London: Humanitarian Practice Network (HPN). United Kingdom, Overseas Development Institute, , 2001.

CHAPTER TWO

Rural Livelihoods and Agricultural Innovation Systems in Malawi

Mariam A.T. Kadzamira

Abstract

The concept of rural agricultural innovation is rooted in the philosophy that thinking should shift from a farm or production systems perspectives, in which the ultimate goal is to produce sufficient food for subsistence, to an agribusiness perspective, in which the goal of agricultural production is to create rural agro-enterprises. So doing creates an enabling environment in which there is an increase in the affordability, accessibility and availability of food at the household level. Many experts agree that innovation and innovation systems are key in unlocking African agriculture and in creating self-sustaining agricultural systems. As innovation systems concepts have become widespread in African agricultural research and development, there has also been the emergence of challenges and criticisms — which are scattered in the literature — which lack robust empirical evidence. This chapter therefore meets this gap by presenting a comprehensive, critical appraisal of the literature pertaining to the concepts of rural livelihoods and agricultural innovation systems. In addition to the literature review the chapter provides empirical evidence of the impact of innovation-systems-driven research interventions on rural livelihoods. In so doing, the chapter demonstrates how a paradigm shift in agricultural research from a top-down linear approach to a holistic approach driven by innovation systems concepts has contributed towards changing the rural household economy and household food security. For the empirical example the researcher used quasi-experimentation with propensity score matching to determine the impact of innovation-systems-driven research interventions on rural livelihoods using the case of an innovation platform from rural Malawi.

Keywords: Rural livelihoods, agricultural innovation systems, farm/production systems perspective, agribusiness perspective, Malawi

1. Introduction

The prevalence of rural poverty and food insecurity in the developing world has led to a paradigm shift in agricultural research. There has been a stride from the strengthening of top-down national agricultural research systems towards non-linear dynamic systems that are geared towards enabling greater innovation, greater capacity by end users to obtain and to properly utilise knowledge and research outputs (Pamuk, Bulte and Adekunle 2014). This shift towards an ‘Agricultural Innovation Systems’ (AIS) perspective views the agricultural research process as a complex and dynamic system, in which the participation of end users is only one part of a complex set of

other processes and interactions between different actors who work together to bring about improvements throughout the agricultural value chain in order to overcome poverty and persistent food insecurity and hunger. The paradigm shift was precipitated by the realisation that despite stronger national research systems, agricultural productivity remained low and food insecurity persisted in many parts of the developing world. This was as a result not only of the lack of appropriate technologies and the lack of access to those technologies, infrastructure, inputs and credit, but also of the lack of access to markets.

The complexity of rural livelihoods and the multi-dimensional nature of poverty entails that the use of AIS in agricultural research and development is not a panacea for food insecurity and poverty in the developing world. Hence, although many experts agree that innovation and innovation systems are key in unlocking African agriculture and in creating self-sustaining agricultural systems, its success requires in-depth understanding of rural livelihoods. Such understanding ensures that innovation systems concepts are contextualised and applied appropriately and effectively. This also requires greater understanding of innovation systems concepts. This chapter, therefore, aims at providing greater understanding of the concepts of rural livelihoods which is treated in the first part of the chapter. An empirical example of the impact of AIS-driven agricultural research and development on rural livelihoods using a case study from Malawi is subsequently provided. This is preceded by a section that provides an insight into the concept of agricultural innovation systems and examples of the use of innovation systems in agricultural research and development on the continent. Finally, the chapter concludes with a brief discussion of the emerging key critiques of the use of innovation systems in agricultural research and development with accent on Africa.

The AIS research paradigm has manifested itself in practice and also in policy, with agricultural research innovation systems approaches featuring highly in policy documents of many African countries (Sanginga *et al.* 2009). Despite this, the direct and indirect impacts of the use of AIS concepts in research and development (R&D) and on food security in the African context have not been rigorously tested. This study narrows this gap by proving empirical evidence of the impacts of AIS on rural livelihoods and food security, thus contributing towards the call for empirical validation of the use of AIS concepts (World Bank 2007a).

2. Understanding African Rural Livelihoods and Agricultural Innovation Systems

2.1. The Concept of Rural Livelihoods: Brief Overview

A livelihood is a means by which a household earns a living for its survival. It differs from mere income in that a livelihood comprises all available resources. These resources include the natural, physical, human, financial

and social assets; the activities that the household or an individual engages in; and the accessibility to those resources and activities as facilitated by the existing institutions and social relations that jointly determine the livelihood outcomes (Serrat 2010). In rural African communities, livelihoods are based on a complex system in which agriculture and natural resources are the centre for survival. As such, the diversification and sustainable utilisation of the natural resource base is essential for the long-term viability of rural livelihoods (Barrett, Reardon and Webb 2001).

A livelihood system is composed of separate components which must be in place in order for the household to obtain a living from the available assets (Niehof 2004; Serrat 2010). The first component of any livelihood system is inputs, which are the different types of resources. In the case of agrarian communities, these would comprise natural resources, such as water, forests and land. These inputs are transformed into livelihood outcome using different strategies and efforts that the household exerts in order to obtain the livelihood outcomes. The transformation of inputs into livelihood outcomes takes place within a context in which the livelihood system interacts with other systems and existing institutions. This context includes all aspects that make the livelihood system vulnerable and includes the greater policy, political and environmental contexts.

The inputs are combined differently through various strategies which make up the livelihood portfolio. The different activities in a household's livelihood portfolio are often complementary. Although actual written farm business plans do not exist in many rural settings, the household plans are practiced extensively in order to determine the type of activities that make up the livelihood portfolios. This process of planning is crucial and determines not only the livelihood outcomes but also the control and utilisation of available resources, which in turn determine the intra-household vulnerability of different household members. The combination of activities in the livelihood portfolio is crafted in such a way that reduces the vulnerability of the livelihood outcomes to shocks arising from the environment. A livelihood system is deemed sustainable when it is able to improve the assets of the household and to maintain its ability to provide for the household not only in the present but also for the future, while at the same time not undermining the natural resource base (Serrat 2010). Complex livelihood systems have been in place since time immemorial in different societies all over the world. They differ depending on spatial, geo-political, cultural and social conditions (Ellis 2000).

2.2. The Concept of Agricultural Innovation Systems (AIS)

An innovation system is a network of actors and organisations that are linked by a common theme with the aim of developing new agricultural technologies, methods and forms of organisation for use by the end users of agricultural technology to tackle identified problems (World Bank 2007b). An innovation system is governed by the prevailing institutions and policies that affect performance of the actors involved and the regulation of

the technologies developed (*ibid.*). Agricultural innovation systems are, therefore, research platforms whose main focus is solving challenges pertaining to agriculture. They consist of interdisciplinary research teams of agricultural scientists from both private and public sectors working with the end users of agricultural technologies as well as other relevant stakeholders, such as agribusiness owners, policy makers and extension agents. The innovation systems concept embraces not only the scientists who are traditionally involved in agricultural research but also the end users of technologies and the interactions that take place between all the actors in the research process (World Bank 2007b). A representation of an agricultural innovation platform is given in Figure 1. The agricultural innovation platform represents an interface where different actors, including interdisciplinary teams of scientists, end users, extension agents, agribusinesses, and other stakeholders, interact in order to identify agreed-upon problems for which innovations need to be developed. The interaction in the innovation platform is non-linear in nature with the different actors networking freely with a component for institutional and human capacity development being key (Pamuk, Bulte and Adekunle 2014). Once problems are identified, actors work together to develop and adapt technologies to the local environment. This leads to improved production and ultimately, enhanced livelihood outcomes.

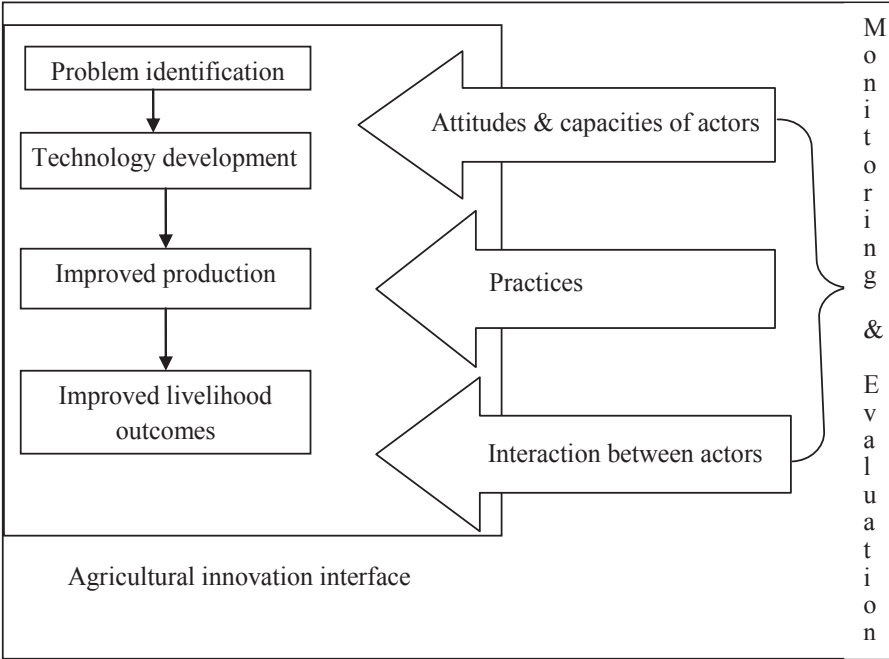


Figure 1. Representation of an Agricultural Innovation Platform

SOURCE: Mapila, Kirsten and Meyer (2012)

Throughout this process, there is constant feedback using mechanisms that are put in place at the onset of the innovation platform. In addition, changes in attitudes, knowledge, skills, practices, and interactions taking place between actors are monitored. The results of evaluations of these aspects are used to develop strategies for improving the capacity of actors to enable them to improve their innovation. There are many forms of innovation, which can also exist in different sectors. Rural innovation in the sphere of agriculture is based on the concept that research programs should work towards identifying the needs of producers and determine how they utilise knowledge either at the farm or enterprise level (Global Forum on Agricultural Research 2001). This entails a shift in the research paradigm from the transfer of knowledge that is generated by research, to research on how knowledge itself is utilised and translated into outcomes by the end users. Furthermore, innovation in the agricultural sphere is conceived as an increase in productivity or competitiveness for a given product; with the improvement in productivity or competitiveness arising from a change in either the production technology or marketing strategy. Innovation is desired to either introduce a new agricultural product on the market or to ensure that producers may become more competitive with an existing product, thus gaining access to more lucrative markets (Global Forum on Agricultural Research 2001). Hence, rural innovation essentially puts agro-industries as the basis for socio-economic development in rural areas. Furthermore, the concept of rural agricultural innovation is rooted in the philosophy that thinking should shift from a farm or production systems perspectives, in which the ultimate goal is to produce sufficient food for subsistence, to an agribusiness perspective, in which the goal of agricultural production is to create rural agro-enterprises (Njuki *et al.* 2008; Kaaria *et al.* 2008) that create employment and income. This would fulfil subsistence food requirements and achieve food security and the creation of thriving rural economies.

The concept of agricultural innovation is not a new phenomenon. Rather, it is a continuum of experiences and approaches from past agricultural research paradigms. The origins of the concept of innovation systems can be traced back to the early 1980s when 'champions' of the idea deliberately constructed and diffused it as a means of promoting national systems of science and technology (Sharif 2006). In the 1990s, the Agricultural Knowledge and Information Systems (AKIS) concept dominated practice and conceptualisation of agricultural research (World Bank 2007a). AKIS focused on the linkages between research, education, extension and the identification of farmers' priorities for new technologies. AKIS recognised that apart from research, there are other ways of generating and gaining access to information. These included scientists building research agendas upon indigenous or rural technical knowledge which encompassed the knowledge, beliefs and customs that people innately possess (Farrington and Martin 1988).

The incorporation of rural and indigenous technical knowledge in the agricultural research processes was the result of experiences and assessments of agricultural research of the 1980s, at a time when participation of farmers took precedence. Farmer Participatory Research (FPR) was implemented mainly through the National Agricultural Research System (NARS). FPR dominated agricultural development and research and involved farmers to a great extent in technology development (Okali, Sumberg and Farrington 1994). FPR can be seen as the base on which current agricultural innovation systems are founded as the FPR concept aimed at not only generating and disseminating technologies but also at changing the orientation of research and development structures in order to build grassroots research capabilities (Okali, Sumberg and Farrington 1994). The commonality between the NARS and AKIS was that both focused on research supply which strengthened research systems. However, the increased supply of new knowledge in itself was an insufficient condition for creating greater capacity for innovation in the agricultural sector (Rajalahti, Woelcke and Pehu 2005). Additionally, the NARS approach assumed a linear relationship in the transfer of knowledge from the researcher via extension to the farmer on the assumptions that the institutions through which this process was taking place were stable (Spielman, Ekboir and Davis 2009). AKIS remedied some of the shortcomings of the NARS approach, as it incorporated the processes of knowledge flows. However, AKIS failed to take into account the diversity of research actors (Spielman, Ekboir and Davis 2009). As such, the paradigm shift in agricultural research practice and conceptualisation from the NARS and AKIS to the prevailing agricultural innovation systems concept was the result of these limitations and the realisation that, without the actual intellectual involvement of the end users of agricultural technologies, attempts to develop new technologies and to increase their dissemination and adoption would be a futile attempt. In the African context, this research approach has largely focused on enabling mainly subsistent and semi-subsistent households to innovate for the market; thus, shifting their livelihoods from a subsistence-orientation to one of market-orientation.

2.3. Innovation Systems Practice in African Agriculture

There are many agricultural research and development initiatives (past and ongoing) on the African continent that are driven by innovation system concepts. These innovation systems interventions are context-specific and are initiated to meet specific goals but they are all guided by innovation systems principles. Table 1 provides examples of some of the agricultural research and development programs in Africa that are driven by innovation systems concepts, but it is not exhaustible as there are numerous initiatives in agricultural rural innovation in Africa (Hall 2007, 10). The various programs presented the Table show that there is a wide diversity of the application of innovation systems in Africa. Despite this diversity, the goals of the programs show that innovation systems concepts are mainly applied

in the African context in order to promote and enhance the commercialisation of traditionally low productive subsistence agriculture — in order to enhance food security and to alleviate poverty.

From the Table, it is possible to see that the use of innovation systems concepts in agricultural research and development and policy has become widespread in Africa. Despite this, empirical studies that show that quantitative improvements in household welfare arising from the use of innovation systems concepts in agricultural research and development are marginal.

Those that exist concur on several points. First the use of innovation systems concepts directly improves household incomes and it indirectly enhances household asset accumulation, housing and farm enterprise re-investments (Kaaria *et al.* 2008; Magreta, Zingore and T. Magombo 2010). Second the use of innovation systems concepts improves market outcomes as it enables smallholder producers to access high value markets and to sustainably meet rigorous quality requirements (Kaganzi *et al.* 2009). In addition, it also improves farmer group performance (Barham and Chitemi 2009).

Table 1. Selected examples of innovation-systems-driven initiatives in Africa

Name of AIS initiative	Country	Main goal	Actors involved
Enabling Rural Innovation (ERI) in Africa	Malawi, Uganda, Zimbabwe, Mozambique, Rwanda, Burundi, D.R. Congo	To improve the livelihoods of households through the creation of rural agro-enterprises	Various actors in each country and in specific research sites. These included local farmer groups, government, private sector, national and international research centers and non-governmental organisations (NGO's)
Partnership for Agricultural Development or the National Innovation Coalition	Sierra Leone, Malawi, Rwanda, Zambia, Nigeria, Tanzania	A national innovation coalition that works to advocate policy makers	Various representatives from various government departments, NGO's in various innovation platforms that have been established in each country (over 30 innovation platforms exist in the six countries)
Floriculture Agricultural Science Technology and	Kenya	Aims to maintain competitiveness of the cut flower industry in Kenya	Flower farmers, research and training institutions, credit and finance institutes, government agencies, input

Name of AIS initiative	Country	Main goal	Actors involved
innovation systems			suppliers, industry associations, bureau of standards
Sustainable intensification of maize-legume cropping systems for food security in Eastern and Southern Africa	Malawi, Zimbabwe, Mozambique, Ethiopia, Kenya, Tanzania, Uganda, South Africa	An agricultural research initiative that aims to use innovation platforms to test and promote new agricultural practices	National Agricultural Research Services; International Agricultural Research Centres, Academia, Regional Research Centres and Ministries of Agriculture and Food Security.
Promoting Local Innovation	Burkina Faso, Ethiopia, Ghana, Kenya, Mali, Mozambique, Niger, Nigeria, Senegal, South Africa, Sudan, Tanzania, Uganda	An NGO initiated program that aims to build a global network to promote local innovations in agriculture	Development partners, international financial institutions, NGO's, international Agricultural research centres.
Fodder Innovation Project	Nigeria	Aims to strengthen the technical capacity of fodder practices thus increasing livestock fodder to improve the livelihoods of peoples that are dependent on livestock	International agricultural research centres and academia
Sub-Saharan Africa Challenge Program	Zimbabwe, Malawi, Mozambique, Rwanda, Burundi, Uganda, the Sahel, Sudan, Northern Guinea	An innovation systems driven agricultural research framework that encourages the engagement of various actors in the value chain in order to promote innovation in an agricultural system	Various partners in each country/pilot learning site and region including farmer originations, national agricultural research institutes and international agricultural research centres and academia

3. Empirical Evidence of the Impact of Innovation Systems Concepts on Rural Livelihoods

This section provides empirical evidence of the impact of AIS-driven research interventions on rural livelihoods in Africa using Malawi as a case study. In so doing, this section demonstrates that the paradigm shift in agricultural research from a top-down linear approach to a holistic approach driven by innovation systems concepts has contributed towards changing the rural household economy (and therefore food security) by enabling and empowering households to produce more with their scarce resources and to make decisions that are strategic and food security enhancing.

3.1. The Study Area

The case study presented was conducted in the Ukwé Extension Planning Area in Lilongwe District, the Central Region of Malawi. Households were sampled from Katundulu, Mphamba and Kango villages. Katundulu and Mphamba villages formed the intervention communities where the Enabling Rural Innovation (ERI) was piloted (see details below); while Kango village was the area where a counterfactual was established. Purposive random sampling was used to select study participants from the intervention community while simple random sampling was used to select study participations from the counterfactual community. A semi-structured questionnaire was used to sample a total of 303 households in the study area, with the counterfactual community sample size being double that of the intervention community sample size in order to allow for better matching of households (Khandker, Koolwal and Samad 2010). Households from the counterfactual community that did not match with those in the intervention community in terms of pre-existing observable social, economic and farming systems characteristics were dropped from the analysis in order to reduce bias and increase robustness.

The ERI in Africa initiative was piloted in three districts in the Central Region of Malawi, one of which is Lilongwe District, the case study area. ERI is an innovative research framework for linking smallholder farmers to markets and its focus was on strengthening the capacity of resource-poor smallholders to access market opportunities. Sanginga and Chitsike (2005) and Ferris *et al.* (2006) provide in-depth guidelines on the use of ERI as a framework for implementing research and development programs. They also provide insights into the roles of different players within the innovation interface from Figure 1. The main aim of the ERI initiative was to create an entrepreneurial culture in rural communities of Africa (Kaaria *et al.* 2008; 2009) guided by six key components that govern its field implementation as follows:

1. Agro-enterprise development and participatory market research;
2. Farmer participatory research and natural resources management;
3. Social and human capital;

4. Gender equity and empowerment of women;
5. Community-based participatory monitoring and evaluation systems; and
6. Effective development and management of partnership.

Furthermore, the ERI initiative is governed by what is called a ‘resource to consumption’ framework which hinges on the following four key principles (Kaaria *et al.* 2009):

1. Technology development and research agenda setting are based on the needs of the end users, existing interests and market opportunities.
2. Technology development is guided by a comprehensive community assessment exercise which aims to mainly understand the constraints and opportunities for technology adoption and reinvestment in natural resources. In addition, the community assessment exercise also aims to understand intra-household allocation and control over resources.
3. Gendered differences in roles and perceptions and differences in the roles of stakeholders are explicitly integrated into the technology development process to ensure equity in accessing technology and in distributing benefits.
4. The ERI intervention helps communities to identify market opportunities and match them with existing community assets.

3.2. Data Analysis

This section provides a description of the analytical tools employed to determine the impact of the use of AIS concepts in a developmental initiative on rural livelihoods. The key to a good impact evaluation is the estimation of what would have occurred in the absence of the intervention. Since impact evaluations are carried out after the program has started or finished, as is the case in this study, *ex-post* changes in outcome variables are used as a measure of impact. The problem with this is that there are many other observable and non-observable time variant characteristics which may alter outcome variables for participants. As such, it becomes difficult to attribute changes in the outcome variables to a specific intervention. This is because comparison of the before and after changes in the outcome variable can lead to either over or under estimation of program impacts. To overcome this problem, commonly called the attribution problem, it therefore becomes necessary to use data on outcome variables from the counterfactual. A valid counterfactual must have very similar observable pre-intervention characteristics to the participants with the only difference being program participation. The availability of data from non-participants is, however, in itself insufficient for attributing differences in outcome variables to a program, as changes in the outcome variables for participants may also arise from “selection bias” in that participants may have been purposefully selected (Ravallion 2005; Khandker, Koolwal and Samad 2010). This implies that those non-participants who are used for comparison purposes must, in addition to having near-identical pre-

intervention characteristics, be those who would have had an equal chance of being selected for participation in the intervention, to overcoming selectivity bias. In the absence of randomisation, which equalises the probability of participation in an intervention thus removing selection bias, matching techniques, specifically Propensity Score Matching (PSM), becomes the solution to the establishment of a valid counterfactual (Khandker, Koolwal and Samad 2010).

The underlying concepts of PSM are that two groups are identified, one that took part in the intervention denoted $H_i = 1$ for household i and another that did not participate in the intervention denoted $H_i = 0$. Intervention households are matched to non-intervention households on the basis of the probability that the non-participants would have participated in the intervention and this probability is called the propensity score (Khandker, Koolwal and Samad 2010). It is given mathematically as follows:

$$P(X_i) = \text{Prob}(H_i = 1 | X_i) \quad (0 < P(X_i) < 1) \quad (1)$$

Where:

X_i is a vector of pre-intervention control variables

These pre-intervention control variables are those which are based on knowledge of the program under evaluation and on the social, economic and institutional theories that may influence participation in the intervention. The vector can also include the pre-intervention values of the outcome variables. Propensity score matching is not able to reproduce the results of randomisation if the variables that influence participation in the intervention are not properly defined.

PSM is driven by two main assumptions:

1. The H_i 's are independent over all i 's
2. The assumption of "conditional independence" or "strong ignorability" which says that outcomes are independent of participation given the variables that determine participation (X_i). In addition, outcomes are also independent of participation given $P(X_i)$ as they would be in a randomised experiment.

PSM equalises the probability of participation across the population just as in randomisation. However, the difference is that PSM achieves this based on conditional probabilities which are conditional on the variables determining participation (X_i).

In this study, propensity scores for each household in the sample were estimated using logistic regression modelling. Using the estimated propensity scores, matched pairs of households were established on the basis of the proximity of propensity scores of the probability of participation in the ERI initiative between the intervention and counterfactual samples. Unmatched counterfactual households were dropped from the analysis in order to remove bias and to increase

robustness (Khandker Koolwal and Samad 2010). The best matched or “nearest neighbour” to the j^{th} intervention household is the counterfactual household that minimises $[P(X) - P(X_j)]^2$ over all j 's in the set of counterfactual households.

A typical PSM estimator of the average impact of any intervention takes the following form (Ravallion 2005):

$$\Delta\bar{Y} = \sum_{j=1}^T \omega_j (Y_{j1} - \sum_{i=1}^C W_{ij} Y_{ij0}) \quad (2)$$

Where:

Y_{j1} is the post intervention outcome variable for the j^{th} household in the intervention;

Y_{ij0} is the outcome indicator of the i^{th} counterfactual household matched to the j^{th} intervention household;

T is the total number of interventions/treatments;

C is the total number of counterfactual households sampled;

W_{ij} 's are the weights applied in calculating the average outcomes of the matched counterfactual households; and

ω_j are the sampling weights used to construct the mean impact estimator.

To avoid contamination by endogeneity of access to the ERI program, the regression model for ERI program participation (which was estimated to generate PSM scores) was run only for the matched comparison group. Hence, the estimator in such cases becomes as follows:

$$\Delta\bar{Y} = \sum_{j=1}^T \omega_j \left[(Y_{ij} - X_j \hat{\beta}_0) - \sum_{i=1}^C W_{ij} (Y_{ij} - X_i \hat{\beta}_0) \right] \quad (3)$$

Where $\hat{\beta}_0$ is the Ordinary Least Squares estimate for the counterfactual matched group.

The impact estimator is approximated without any arbitrary assumptions about functional forms and error distributions, as PSM does not require a parametric model linking program participants to outcomes (Ravallion 2005). This makes PSM superior to non-experimental regression-based approaches.

A logistic regression model of participation in the ERI initiative was estimated in order to determine the probability of a household participating in the intervention by generating propensity scores. Participation in ERI was, therefore, modelled as a dichotomous dependent variable determined by a set of exogenous variables that were crucial for determining participation in the ERI intervention as determined at the onset of the program. These included frequency of contact with extension agents prior to the ERI intervention, sex of the household head, and an index of

previous participation in other development interventions as well as size of the household. The logistic regression model of ERI participation that was estimated to generate propensity scores was a good predictor of participation as demonstrated by the results of two alternative tests of goodness of model fit, the Hosmer and Lemeshow (H-L) statistic and the chi-square test (Table 2). The H-L goodness of fit test statistic was 10.310 and non-significant ($p=0.244$), indicating that the model was a good fit. A rule of thumb for accepting a logistic regression model is that the H-L statistic must be greater than 0.05 and should show non-significance (Hosmer, Lemeshow and Sturdivant 2013). Further, the model has a chi-square statistic of 23.747 which was statistically significant at the 1% confidence level. This implied that all the predictors that were included in the model were capable of jointly predicting participation in the ERI initiative. As such, the model is a good determinant of the factors influencing participation in the ERI initiative. This, therefore, implies that the model is capable of approximating the probability of a household's participation in the ERI initiative and it is capable of correctly generating propensity scores.

Table 2. Parameter estimates of the logistic model of ERI participation

	Co-efficient	Significance	Odds ratio
Constant	-1.426	0.136	0.240
PRE_EXT_CONT	-0.157	0.019	0.855
SEX_HHEAD	0.571	0.118	1.771
HH_SIZE	0.092	0.087	1.092
PRE_PART_PREVIOUS ¹		0.003	
PRE_PART_PREVIOUS(1)	-0.559	0.310	0.572
PRE_PART_PREVIOUS(2)	1.486	0.068	4.419
<i>Model Chi square</i>	<i>23.747***</i>	<i>Log-Likelihood</i>	<i>361.980</i>
<i>H-L Chi square</i>	<i>10.310 (p=0.244)</i>	<i>Nagelkerke R-square</i>	<i>1.205</i>
N=303			

Therefore, using propensity scores for participation generated from the logistic regression model, households in the intervention community were matched to households in the counterfactual community on the basis of the proximity of propensity scores. All other households whose propensity scores for participation were far from the range of scores for the intervention households were dropped from the analysis. Dropping all the control households whose probability of participation was very different from those of the intervention households made it possible to compare differences in livelihood outcomes between households that were similar and ,therefore, comparable. Thus, any differences in outcome variables

between the participants and non-participants could be attributed to the intervention (Ravallion 2005).

3.3. Discussion of Empirical Results

3.3.1. Impact on Production Outcomes

The ERI intervention impacted upon many aspects of household production with statistically significant differences being observed for the outcomes pertaining to livestock production, upland crop production, value of maize production and asset ownership— all of which contribute towards improving rural household food security. Differences in maize yields were found to be unaffected by participation in the ERI intervention, implying that the ERI initiative did not have an impact on maize productivity. This finding is plausible because it is possible to increase production without necessarily increasing productivity (Beattie and Taylor 1985). Hence, in the study area, it is possible to deduce that participating households managed to increase production of maize, not necessarily productivity, but by increasing the area under maize cultivation.

An analysis of the value of all upland crops for the households in the study finds that the ERI intervention increased the value of crops produced for participating households by USD812.34 and USD627.10 for the 2007/2008 and 2008/2009 cropping seasons, respectively (Table 3). The differences in the value of all upland crops were statistically significant at the 1% and 5 % confidence levels for the 2007/2008 and 2008/2009 seasons, respectively.

Table 3. Impact of the ERI intervention on production outcomes

Production outcomes (USD)	Intervention community		Counterfactual community		ERI program effect
	Mean	Standard deviation	Mean	Standard deviation	
Total value of livestock	445.03	1620.99	144.82	926.47	300.12*
Total value of upland crop production 2007/2008	1349.48	0.016	537.14	0.0114	812.34***
Total value of upland crop production 2008/2009	992.24	0.0179	365.14	0.0084	627.10**
Value of maize harvest 2007/2008	259.35	308.77	180.01	340.24	79.33
Value of maize harvest 2008/2009	506.76	0.013	219.66	490.80	287.09*
Maize yield 2007/2008 (Tons/hectare)	0.84	1.00	0.85	1.47	0.0055
Maize yield 2008/2009 (Tons/hectare)	1.17	2.61	0.88	1.33	0.287
Total value of assets	550.74	3008.51	159.65	581.58	391.00*

* Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level

Furthermore, the results also show that in the 2008/2009 season, the value of maize produced by intervention community households was significantly higher than for households in the counterfactual community by USD287.09 at the 10 per cent level of confidence. This was, however, not the case for the 2007/2008 harvest season, as differences in maize production between the intervention community and counterfactual community households were not statistically significant. The difference in value of maize production in the 2008/2009 season cannot be attributed to higher maize prices for producers in the 2008/2009 season, which were at USD295.89 per ton as compared to prices in the 2007/2008 season of USD125.99 per ton; or to price differentials between the intervention community and counterfactual community. This is because an analysis of the farm gate prices for the different communities showed that all households in the study area received the same farm gate prices with no statistically significant differences being observed between maize prices in either community. Second, differences in maize production in the 2008/2009 season cannot be attributed to yield differences, as the results indicate that there were no statistically significant differences in the yields of maize between households in the intervention community and counterfactual community.

The significant differences in maize production between the intervention community and counterfactual community can, therefore, mainly be attributed to the fact that households in the intervention community cultivated more land than their counterparts in the counterfactual community did. This is evidenced by statistically significant differences in the total land-holding sizes and the total number of separate farm plots that households in the intervention community owned and planted as compared to matched households in the counterfactual community. Households in the intervention community owned on average 1.72 hectares of land, while the matched counterfactual community households owned on average 1.23 hectares of land. In general, households in both communities tend to cultivate the majority of the land that they own with approximately 95 per cent of the land that is owned and is under cultivation in either community in the 2008/09 harvest season. Households in the intervention community cultivated on average 3.1 separate pieces of farm plots; while matched counterfactual community households cultivated on average 2.2 separate pieces of farm plots. The differences in the land ownership and the separate pieces of cultivated farm plots between the intervention community and counterfactual community were statistically significant at the 5 per cent and 1 per cent confidence levels, respectively.

Increased staple food production coupled with food access and utilisation is key component for food security (Funk and Brown 2009). In Malawi, own food production is key for food security because smallholder staple food production is heavily reliant on rain-fed farming which creates uncertainty of food production due to climatic variability. For this case study, the higher value of upland crop production (2007/2008 and 2008/2009 seasons) and maize harvests (2008/09 seasons) by households in ERI intervention

communities is, therefore, an indication that the use of innovation systems concepts in rural livelihoods development has the potential for the enhancement of rural household food security.

Analysis of differences in household assets and livestock ownership shows that the ERI initiative was significant in increasing the value of households' total assets and livestock ownership by USD391.00 and USD300.12, respectively. Both of these differences were statistically significant at the 10 per cent level of confidence. Hence, households in the intervention community had higher valued assets than households in the counterfactual community. An analysis of the differences in livestock prices showed that there were very small differences between the market prices of the three major types of livestock traded in the study area; with the average price for the 2008/2009 season of chickens, pigs and goats not being statistically different between the two communities.

As such, it can be deduced that households in the intervention community had larger numbers of livestock as compared to households in the counterfactual community. This is confirmed by the statistical analysis which showed that households in the intervention community owned an average of about 4 or more chickens and one extra pig and goat each as opposed to households in the counterfactual community. The differences in the ownership of all three classes of livestock were highly statistically significant. A major contributing factor to the larger livestock numbers in the intervention community, especially in terms of pig ownership, is that piggery was the agro-enterprise chosen to be developed under the ERI program. Because of this, participation in ERI entailed that households made more investments in the piggery through improved housing, feeding and hygiene; and improved their day-to-day management by keeping a record of all activities pertaining to the piggery. Participating households were trained in the construction of appropriate housing and feed formulation as well as in pest and disease control. In addition, farmer participatory research was put in place to test different feeding options and the cultivating of various types of feeds (Njuki *et al.* 2007). These changes, together with greater market access arising from the establishment of a marketing committee in the community which was responsible for sourcing markets, led to the establishment of a stable market especially for piglets which resulted in increased incomes. From informal interviews with participating households, it was revealed that this increased income, in combination with changes in the decision-making processes of participating households, enabled them to invest more in household assets as well as in other types of livestock.

Livestock is crucial for rural household food security outcomes as livestock products and income are used as an asset to secure food, are reinvested for household food consumption and indirectly provide employment and income, with which households use to acquire food (Herrero *et al.* 2013; Smith *et al.* 2013).

3.3.2. Impact on Household Cash Income

Analysis of the differences in household incomes indicates that the ERI intervention positively influenced cash incomes in both the 2007/2008 and 2008/2009 cropping seasons for the households who participated in the intervention. As can be seen in Table 4, households who participated in the ERI intervention had on average US\$280.21 and US\$340.54 more total income than their counterparts in the counterfactual community for the 2007/2008 and 2008/2009 cropping seasons, respectively. The differences in household incomes were statistically significant at the 5 per cent confidence level.

Table 4. Impact of the ERI intervention on household cash incomes

Household cash incomes (USD)	Intervention community		Counterfactual Community		ERI program effect
	Mean	Standard deviation	Mean	Standard deviation	
Total cash income from wetland 2008	27.24	87.27	23.67	66.98	3.56
Total cash income from wetland 2009	14.46	32.49	29.79	52.87	-15.39*
Total cash income for 2007/2008 season	511.49	0.0072	231.28	465.61	280.21**
Total cash income for 2008/2009 season	636.21	0.0088	299.56	655.75	340.54**
Total income from livestock sales 2008/2009	51.34	138.48	23.60	186.08	27.78

* Significant at 10% level; ** Significant at 5% level; *** Significant at 1% level

Increased cash incomes can be attributed to the ERI intervention focusing on assisting farmers to develop agro-enterprises in order to meet existing market opportunities as opposed to their marketing any surplus out of what they grew for subsistence. Hence, intervention communities conducted an analysis of existing market opportunities prior to the onset of the agricultural year in order to determine the type of agro-enterprises that would be most profitable. Through this analysis, the community identified piggery and dry bean cultivation as the most profitable agro-enterprises (Njuki *et al.* 2007). Off-farm income, such as that obtained from trade in agricultural goods² has been found to positively affect household food security. This is because off-farm income contributes to higher food production and increased farm income (Babatunde and Qaim 2010) through reinvestments in the farming enterprise.

Furthermore, the ERI intervention negatively affected incomes from the sale of crops cultivated in the wetland during the short dry season. Farmers in the intervention community had lower incomes from the wetlands as compared to households in the counterfactual community, with incomes in

the intervention community being lower by USD15.39 in the 2009 winter season. This difference was statistically significant at the 10% level of confidence. This was the case despite more households in the intervention community having wetlands as compared to households in the counterfactual community; with 94.1 per cent and 56.4 per cent of all sampled households in the intervention community and counterfactual community owning a wetland, respectively. The winter season, which involves the cultivation of wetlands along rivers and streams, using residual moisture or irrigation, is a critical season for many rural producers in Malawi. For resource-poor farmers, cultivation during the winter season is mainly used for seed production. Hence, the majority of resource-poor smallholders who market a large portion of their harvest from the winter season are left without sufficient seed for the next rainy season; and are thus less prepared for the onset of the main cropping season. One of the key areas of the ERI intervention was to build the capacity of households to better understand their farming systems and opportunities as well as threats to their livelihoods. Hence, the lower returns in sales from the wetland can be attributed to households in the intervention using the winter cultivation as an opportunity to retain seed for the main cropping season.

3.3.3. *Impact on Fertiliser Use Patterns*

The impact of the ERI intervention on fertiliser use patterns in the intervention community was assessed by analysing the differences in the number of 50 kg. bags that farmers used per hectare of farm land. Inorganic fertilisers, in combination with hybrid seeds and good rainfall, play a crucial role in ensuring maize production and food security in Malawi. Hence, purchasing inorganic fertiliser demonstrates a household's decision-making patterns in terms of reinvestment in their farm enterprise. Table 5 shows that there were statistically significant differences between the amounts of inorganic fertiliser applied between the intervention community and counterfactual community households in the 2004/2005, 2005/2006 and 2006/2007 agricultural seasons at the 1%, 5% and 10% confidence levels, respectively.

Table 5. Impact of the ERI intervention on fertiliser use patterns

Fertiliser use patterns (no. of 50 kg bags)	Intervention community		Counterfactual community		ERI program effect
	Mean	Std. Dev.	Mean	Std. Dev.	
2004/2005	1.24	1.85	0.567	1.55	0.679***
2005/2006	1.38	1.87	0.624	1.12	0.761**
2006/2007	1.50	1.88	0.858	1.38	0.644*
2007/2008	1.68	1.97	1.38	3.39	0.297
2008/2009	1.95	2.49	1.77	6.18	0.171

*Significant at 10% level; **Significant at 5% level; ***Significant at 1% level

Between the 2004/2005 and 2006/2007 cropping seasons, households in the intervention community applied on average nearly one extra 50 kg. bag of inorganic fertiliser as compared to households in the counterfactual community. This difference can be attributed to the ERI intervention, as the increased market outcomes acted as incentives for households to reinvest in technology, such as inorganic fertiliser in order to sustain their agro-enterprise. In general, the study finds that all households in both communities were applying an amount of fertiliser that was below the recommended rates for maize production for areas with low soil nutrients (Nitrogen, Potassium, Zinc and Phosphorous) 4 bags 23.10.5+6S+1.0 Zn per hectare for basal dressing and top dressing with 4 bags with the same 23.10.5+6S (Mutegi *et al.* 2015).

Further observation shows that in more recent years, the differences in the amounts of inorganic fertiliser applied by households in the study area were less distinct. In the 2007/2008 and 2008/2009 cropping seasons, the differences are non-significant between the intervention community and counterfactual community. This can be attributed to the increased supply of fertilisers due to the implementation of the full fertiliser subsidy program in the country. The implementation of the fertiliser subsidy program increased the availability and accessibility of inorganic fertiliser throughout the rural areas of the country, thus increasing the opportunity for all farmers to access inorganic fertiliser. This was the case despite informal interviews with farmers, revealing that initially when the fertiliser subsidy program had started in the 2005/2006 season, farmers tended to sell their coupons for cash. They would then use part of the cash received to purchase a small amount of fertiliser (e.g. one 20 kg bucket) and to meet other household needs. In the intervention community, it was found that in subsequent years as farmers become more organised under the ERI program; they refrained from the practice of selling their subsidised coupons. Hence, the increased fertiliser use in the intervention community can further be attributed not only to the implementation of the fertiliser subsidy program but also to improved and better decision-making on the part of farmers as a result of the ERI intervention.

4. Skepticism Surrounding Agricultural Innovation Systems

The widespread of innovation systems concepts in African agricultural research and development has been challenged and subject to criticism. This section presents the three broad challenges and criticisms of the application of innovation systems concepts in agricultural research and development in the African context.

Firstly, the use of innovation systems concepts in African agriculture is confounded by significant operational challenges brought about by the lack of practical guidelines for translating the key principles of innovation systems into practical use for the varied contexts of African agricultural systems (Ergano *et al.* 2010). This is because the use of innovation systems

in African agriculture is at an early stage. At the same time, innovation systems evolve in response to the context in which they are being applied. Hence, this entails that practical guidelines covering the diversity of African agriculture are unlikely to be developed. The operational challenges of the use of innovation systems concepts in African agriculture is more of a reflection of the lack of capacity on the part of practitioner's to fully comprehend, use and translate innovation systems concepts in the African agricultural context.

Secondly, there is lack of sufficient resources to support rural innovation. This arises from the 'smallness of the market for smallholder innovation', which makes it difficult to attract private investment (Jones 2006). This has further been confounded by a reduction in agricultural research funding from both international and national sources due to disappointment with the impacts of agricultural research in the past (Jones 2006; Igbatayo 2010). Apart from the reduction in funding for agricultural research and development, Hall (2007) argues that both private and public investment have not fully responded to the paradigm shift in agricultural research and development towards an innovation systems orientation. This is attributed to the inability of innovation systems advocates to create a functional, consistent and influential platform for lobbying public policy makers and private investors. Instead, what one observes in practice is pockets of different and competing innovation systems interventions that are implemented at relatively small scale (e.g. at farmer group level), which sometimes fail to be scaled up and out.

Thirdly, the inability of agricultural innovation systems in Africa to attract funding can be linked to the lack of empirical evidence that provides conclusive policy recommendations and which shows the usefulness of innovation systems in African agriculture (Spielman 2006). This lack of evidence is the result of the difficulties associated with measuring the complexities of agricultural innovation interactions and performance (Spielman and Kelemewonk 2009). These complexities result into the use of non-diversified descriptive methods to assess the outcomes of the application of agricultural innovation systems in the developing country context (Spielman 2006). The problem with this is that evidence generated from such assessments is not relevant for policy makers as it does not provide concrete policy recommendations to allow for the development and implementation of strategies; nor does it facilitate the allocation of resources for promoting the use of innovation concepts in agriculture by policy makers (Spielman 2006; World Bank 2007b; Spielman and Kelemewonk 2009). Hence, in order for innovation systems thinking to become relevant to policymaking and to contribute towards poverty reduction, generating robust empirical evidence is needed.

5. Conclusion

The importance accorded to innovation systems in agricultural research and development for improved household food security and livelihoods has only begun to be tangibly demonstrated by empirical evidence. Using a case study from Malawi, this chapter has demonstrated that statistically significant differences exist between households in the intervention community and counterfactual community. The difference can be attributed to the use of innovation systems concepts in the implementation of a development and research initiative called the Enabling Rural Innovation (ERI) initiative in Africa. Positive impacts of the ERI initiative have been demonstrated for different livelihood outcomes, including production, income generation, fertiliser use patterns, as well as trainings and membership of farmer groups for households in the communities in which it was implemented. Hence, agricultural innovation systems driven research interventions have the potential to impact upon and change the livelihood outcomes of rural households in the African context.

Even with evidence of success, the use of innovation systems concepts in agricultural research and development in Africa is plagued with criticisms and challenges, which have not been exhaustively studied or understood. Despite the criticisms and challenges to the use of innovation systems in African agriculture, the focus by the global agricultural research and development arena and policy makers worldwide is on innovation and innovation systems (Hall 2007) as a key in unlocking African agriculture and in creating self-sustaining agricultural systems. However, in order for innovation systems to be effective in this regard, there is need to harness the diversity of innovation systems experiences and conceptualisation to create a diverse but unified platform of what Hall (2007) terms collective innovation or innovation diversity. One component to working towards this collective innovation is further understanding the impacts of the use of innovation systems in different contexts on the continent. As this would enable the creation of context-specific evidence on which effective unified platforms for lobbying policy makers would be created, it facilitates working towards reducing food insecurity, malnutrition, low agricultural productivity and poverty.

Notes

- ¹ Previous participation is interpreted for the high previous participants and the intermediate/low previous participants separately. This presentation of categorical variables in logistic regression models is common and accepted practice. These results show that those that had high previous participation (pre-previous (2)) in development projects had higher probability of also participating in the ERI. The odds of the intermediate/low (pre-previous (1)) previous participants are shown to be lower.

- ² Trade in agricultural goods is a form of off-farm self-employment (Babatunde and Qaim 2010). In the ERI initiative, households engaged in trade of beans and in a piggery enterprise which created self-employment.

References

- Babatunde, R.O. and M. Qaim. 2010. Impact of off-farm income on food security and nutrition in Nigeria. *Food Policy*, 35(4): 303–311.
- Barham, J. and C. Chitemi. 2009. Collective action initiatives to improve marketing performance: Lessons from farmer groups in Tanzania. *Food Policy*, 34(1): 53–59.
- Barrett, C.B., Reardon T. and P. Webb. 2001. Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy*, 26(4): 315 – 331.
- Beattie, B.R. and C.R. Taylor. 1985. *The economics of production*. New York. John Wiley & Sons.
- Ellis, F. 2000. *Rural livelihoods and diversity in developing countries*. Oxford: Oxford University Press.
- Ergano, K., A. Duncan, A. Adie, A. Tedla, G. Woldewahid, Z. Ayele, G. Berhanu and N. Alemayehu. 2010. Multi-stakeholder platforms strengthening selection and use of fodder technologies in Ethiopia: Some lessons. ISDA 2010, Montpellier, France, 28 June–1 July. Online: <https://hal.archives-ouvertes.fr/hal-00522978/document>.
- Farrington, J. and A. Martin. 1988. *Farmer participation in agricultural research: A review of concepts and practices*. London: Overseas Development Institute.
- Ferris, S., E. Kaganzi, R. Best, C. Ostertag, M. Lundy and T. Wandschneider. 2006. *A market facilitators' guide to agro-enterprise development. Enabling rural innovation in Africa Guide 2*. Cali: International Centre for Tropical Agriculture.
- Funk, C. and M.E. Brown. 2009. Declining global per capita agricultural production and warming oceans threaten food security. *Food Security*, 1(3): 271–289.
- Global Forum on Agricultural Research. 2001. Linking farmers to market: Post-harvest, rural innovation systems and SME's. Background document. September. Rome: GFAR. Online: http://www.fao.org/docs/eims/upload/216243/Linking_Farmers_Market_Background_Document.pdf.
- Hall, A.J. 2007. Challenges to strengthening agricultural innovation systems. Where do we go from here. UNU-MERIT Working Paper # 2007/038. Online: <http://collections.unu.edu/eserv/UNU:520/wp2007-038.pdf>.
- Herrero, H., D. Grace, J. Njuki, N. Johnson, D. Enahoro, S. Silvestri and C. Rufino. 2013. The roles of livestock in developing countries. *Animal*, 7(1): 3–18.

- Hosmer, D.W., S. Lemeshow and D.X. Sturdivant. 2013. *Applied logistic regression*. 3rd ed. New Jersey: John Wiley and Sons.
- Jones, M. 2006. An agricultural research perspective on poverty, innovation policies and agricultural development in sub Saharan Africa. *In: Agricultural development in Sub Saharan Africa*, edited by M. Hårsama. Expert Group on Development Issues workshop proceedings. 8 – 9 March. Online: http://www.fanrpan.org/documents/d00464/Agric_dev_SSA_EGDI_2007.pdf
- Igbatayo, S. 2010. Fostering agricultural innovation systems for sustainable development in Africa. Presentation made at the UNECA Expert group meeting on Harnessing Knowledge to achieve the Millennium Development Goals. Addis Ababa. 6 - 9 July.
- Kaaria, S., J. Njuki, A. Abenakyo, R. Delve and P. Sanginga. 2009. Enabling Rural Innovation: Empowering farmers to take advantage of market opportunities and improve livelihoods. *In: Innovation Africa: Enriching farmer's livelihoods*, edited by P.C. Sanginga, A. Waters-Bayers, S. Kaaria, J. Njuki and C. Wettasinha, pp. 167–185. London: Earthscan Publications.
- . 2008. Assessment of the Enabling Rural Innovation (ERI) approach: Case studies from Malawi and Uganda. *Natural Resources Forum*, 32(1): 53–63.
- Kaganzi, E., S. Ferris, J. Barham, A. Abenakyo, P. Sanginga and J. Njuki. 2009. Sustaining linkages in value markets through collective action in Uganda. *Food Policy*, 34(1): 23–30.
- Khandker, S.R., G.B. Koolwal and H.A. Samad. 2010. *Handbook of impact evaluation*. Washington D.C.: The World Bank.
- Magreta, R., S. Zingore and T. Magombo. 2010. Analysis of effective market linkages in promoting investments in natural resource management in the rice-based farming system in Malawi. A case of Nkhate irrigation scheme. Paper presented at the conference on 'Innovation and Sustainable Development in Agriculture and Food', Montpellier, 28 June – 1 July.
- Mapila, M.A.T.J., J.F. Kirsten and F.H. Meyer. 2012. The impact of Agricultural Innovation Systems interventions on rural livelihood outcomes in Malawi. *Development Southern Africa*, 29(2): 303–315.
- Mutegi, J., V. Kabambe, S. Zingore, R. Harawa and L. Wairegi. 2015. The status of fertilizer recommendation in Malawi: Gaps, challenges, opportunities and guidelines. Lilongwe: The Soil Health Consortium of Malawi. Online: <http://soilhealthconsortia.org/files/Malawi%20Fertilizer%20Recommendation%20Report.pdf>.
- Niehof, A. 2004. The significance of diversification of rural livelihood systems. *Food Policy*, 29 (4): 321–338.
- Njuki, J., S. Kaaria, P. Sanginga, E. Kaganzi and T. Magombo. 2007. Empowering communities through market let development: Community agro-enterprise experiences from Uganda and Malawi. Paper presented at the Farmer First Revisited: Farmers participatory research and development Twenty years on. London. 12 – 14 December.

- Njuki, J., S. Kaaria, P.C. Sanginga, F. Murithi, M. Njunie and K. Lewa. 2008. Building capacity for participatory monitoring and evaluation: integrating stakeholder's perspectives. *In: Innovation Africa: Enriching farmers livelihoods*, edited by P.C. Sanginga, A. Waters- ayers, S. Kaaria S; J. Njuki and C. Wettasinha, pp. 358 – 373. London: Earthscan Publications.
- Okali, C., J. Sumberg and J. Farrington. 1994. *Farmer participatory research: Rhetoric and reality*. London: Intermediate Technology Publication.
- Pamuk, H., E. Bulte and A.A. Adekunle. 2014. Do decentralized innovation systems promote agricultural technology adoption? Experimental evidence from Africa. *Food Policy*, 44: 227 – 236.
- Rajalahti, R., J. Woelcke and E. Pehu. 2005. Developing research systems to support the changing agricultural sector. *ARD Discussion paper, 14*. Washington D.C.: World Bank. Online: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2012/08/02/000356161_20120802030412/Rendered/PDF/336100REPLACEM0earch0Workshop0FINAL.pdf.
- Ravallion, M. 2005. Evaluating anti-poverty programs. *In: Handbook of development economics, Volume 4*, edited by T. Schultz and J. Strauss, Pp. 3788 – 3840. Amsterdam: North Holland.
- Sanginga, P. and A. Chitsike. 2005. *The power of visioning: A handbook for facilitating the development of community action plans. Enabling Rural Innovation Guide 1*. Cali: International Centre for Tropical Agriculture. Online: <http://r4d.dfid.gov.uk/PDF/Outputs/NatResSys/R7856Vis.pdf>.
- Sanginga, P.C., A. Waters-Bayers, S. Kaaria, J. Njuki and C. Wettasinha. 2009. Innovation Africa: Beyond Rhetoric to Praxis. *In: Innovation Africa: Enriching farmer's livelihoods*, Edited by P.C. Sanginga; C. Waters-Bayers, S. Kaaria, J. Njuki and C. Wettasinha, pp. 374 – 386. London: Earthscan.
- Serrat, O. 2010. *The sustainable livelihoods approach*. Washington, D.C.: Asian Development Bank.
- Sharif, N. 2006. Emergence and development of the National Innovation Systems concept. *Research Policy*. 35(5): 745 – 766.
- Smith, J., K. Sones, D. Grace, S. MacMillan, S. Tarawali and M. Herrero. 2013. Beyond milk, meat and eggs: Role of livestock in food and nutrition security. *American Society of Animal Science*, 3(1): 6 – 13.
- Spielman, D.J. 2006. A critique of innovation systems perspective on agricultural research in developing countries. *Innovation Strategy Today*, 2(1): 41–54.
- Spielman, D.J. and D. Kelemewonk. 2009. Measuring agricultural innovation systems properties and performance: Illustrations from Ethiopia and Vietnam. *International Food Policy Research Institute Discussion Paper, No. 000851*. Online: <http://www.ifpri.org/sites/default/files/publications/ifpridp00851.pdf>.

- Spielman, D.J., J. Ekboir and K. Davis. 2009. The art and science of innovation systems inquiry: Applications to Sub-Saharan Africa. *Technology in Science*, 31(4): 399 – 405.
- World Bank. 2007a. *World Development Report 2008: Agriculture for development*. Washington, D.C.: The World Bank.
- . 2007b. *Enhancing agricultural innovation: How to go beyond the strengthening of Research systems*. Washington, D.C.: The World Bank.

CHAPTER THREE

Some Indicators of Food Security Challenges in Eastern and Southern Africa: Lessons from the Land Use Consolidation in Rwanda

Herman Musahara

Abstract

Food insecurity is a global challenge closely linked to poverty. The global lobby for Global Development has indicated food security is Goal number 1. Moreover, there cannot be any freedom where there is hunger. Yet, despite the recognition and efforts for decades, hunger and food insecurity are still on the forefront of mankind's agenda. The evaluation of the progress and challenges in the implementation of the Millennium Development Goals indicates that the Sustainable Development Goals inherit a grossly unachieved MDG1 which in reality is the basis of all the goals. The problem of food insecurity and thus poverty is most critical in Sub-Saharan Africa. Using the Eastern and Southern African countries within the OSSREA outreach, this chapter tries to show the magnitude of the problem and the sources of food insecurity in Africa in general and specific countries in particular. One argument advanced by the chapter is the need to decompose at policy level the complex nature of food insecurity. This is done generally for countries in Eastern and Southern Africa on which data is available in common databases. For a specific analysis, Land Use Consolidation initiative in Rwanda is used as an institutional and policy innovation for food security in Rwanda. The paper uses data collected from a recent survey to show that part of the solution is to clearly distinguish at policy level between availability, access and use of food stocks, a step which leads to taking appropriate policy actions via robust, holistic and long-lasting policy frameworks. The lessons identified can be used for a broader and general adoption to other places in Sub-Saharan Africa.

Keywords: Food security, Sub-Saharan Africa, Rwanda, land use consolidation, access, availability and use

1. Introduction

The chapter is within the frame of searching for institutional and social innovations for food security in Eastern and Southern Africa. Its basic and obvious premise is that achieving food security is a prime challenge of development in Sub-Saharan Africa. Food insecurity is a problem both absolutely and relatively. More than 1.2 billion people in the world are poor and the most primary reason is that they do not have enough to eat. The poverty definition is based on the ability to subsist with the minimum of

food for a healthy life. But, it is also a relative problem of being able to access adequate food and nutrition.

The chapter is generally based on secondary data and review of a targeted literature. The section on Rwanda is based on papers outlining results of a study carried out in 2013 and 2014. The data set that had been created is not yet open for use. There are wide databases on food and agriculture which can support regional and country analysis. The most readily available data sets are those by the Food and Agricultural Organisation of the United Nations (FAO). FAO has an extensive and comprehensive database created over the past 50 years. Besides, it is the single most important source of data for comparison of countries which can always be complemented by others such as World Development Indicators (WDI) of the World Bank, International Food Policy Research Institute (IFPRI), International Fund for Agricultural Development (IFAD) and World Health Organisation (WHO).

At regional level, every country has a Bureau of Statistics. The international and regional organisations also undertake more focused studies. The regular monitoring of MDGs has conditioned countries to look at progress out of poverty. One of the areas of interest has been related to food poverty reduction.

The focus has been Eastern and Southern Africa in general and Rwanda in particular. Eastern and Southern Africa is convenient as the scope of operations of OSSREA, the promoter of the project, but also as a region in Sub-Saharan Africa where food security has been a major concern. With occasional famines, drylands and rain-fed agriculture, food security has been an important measure of development. The article presents extensively aspects of food security from of selected indicators. The value lies in how numbers are interpreted. It is also a basis for a wider geographical coverage of the food security challenges of countries and the variance among these countries which were selected on the bases of availability of data for a period of 15 years from 2000 through 2015. The individual and contextual situation of each of the case countries is another level of analysis partially covered by other articles in the book but that could start from available data sets.

Rwanda has been chosen on the assumption that rapid economic growth should be a measure of good progress but it will only be important to prosperity so far as it includes food security and improved livelihoods. The case study provides a basis for the validation of the latter argument. Land Use Consolidation (LUC) has been an innovation at institutional level, in the use of land where there is stress on land availability and rapid population growth. LUC is also related to social organisation, such as settlements and livelihoods, ability to get more income and cope with vagaries of food deficits in rural areas. While LUC has led to dramatic gains in productivity and food production, the fact that the country had attained food security has provoked a heated contestation. While it looked

like a real debate and a contradiction with knowledge of food insecurity in rural areas, simple lesson can be gained from analysing food security comprehensively so as to determine the sustainability of innovation in terms of its robustness to ensure food security as a whole.

The article provides a brief review of concepts and approaches in section 2. Section 3 summarises the regional food security situation and thus challenges using available data sets. Section 4 describes the economic context and resulting food security debate in Rwanda and uses the knowledge from LUC—the innovative land use initiative—to answer that. Section 5 is a conclusion and lessons for food security.

2. Conceptual Framework

The concept of food security is one of the primary concerns of scholars, countries, domestic and international organisations. The first explanation is that food security reflects the level of poverty of individuals, households and countries. While for a time the definition was a subject of contention, the World Food Summit in Rome defined it as,” *Food security is the physical economic and social access to dietary requirement at all times that will enable a person to run an active and healthy living.*” (FAO 1996: 2).

It is almost agreed that food security is not about volumes of food products produced, but availability, as well as access, use and stability of food. Thus food security is both a supply and demand issue. It is not enough for a house or country to produce large quantities.

More recently, however, the concept of food security has been approached in more ways than one and especially beyond food supply and agricultural production (UNDP 2012). The analysis by Burchi and Muro for UNDP is good for understanding food security in a more nuanced way but also the more sophisticated entitlements and capability approach that was introduced by Sen (1983).

Food availability is the oldest and most influential approach. It is about equilibrium of food and population first presented by Thomas Robert Malthus in his essay on population in 1789. Malthus (1789) had noted that population grows in a geometric progression while food grows in arithmetic progression. If population was not checked and a country reaches a point where food supplies growth rate had been overcome by population growth, then there would be catastrophic consequences that would lead to automatic adjustment of the balance. The thesis was dubbed a prophecy of doom and dismissed. Yet, it is still used and provides a good basis for the importance of food security. In this approach, the food security aggregate is expressed as food availability *per capita*. In a closed economy, this is dependent on agricultural food production but in a more open model, food trade is part of this meaning.

The second approach is income (UNDP 2012), which is more of the macroeconomic dynamics of the economy that affects food security. This

approach brings in the role of GDP, GDP *per capita* and economic growth in the food security discourse. But, it also brings in the microeconomic aspects of food security which make food security an aspect of food poverty. Food poverty is where there is limited income and a threshold below average in which case a person cannot afford to acquire a bundle of goods required for survival. The earliest definitions went further to estimate the biological requirements of calories below which a person could not survive (Rowntree 1901). Besides the challenges of measurements, however, the income approach virtually assumes inexistence of subsistence economy. The determination of the earliest poverty line below which a person cannot survive has remained abstract. There are also more advantages of looking at the issue of poverty from consumption side, especially, if all incomes cannot be estimated. There are inestimable cultural and non-income factors that have entered the debate of poverty and food security.

The Basic Needs Approach proposed by ILO (1976) and further consolidated by Streeten (1981) and Stewart (1985) is the third approach on food security. Food is a basic need just like clothing and shelter. Food became a basic right and led to the concept of Food First (Maxwell 1996). This approach focuses on the adequacy and food security being about having enough to eat rather than the amount of income. The Entitlements approach was brought about by Sen (1981) and later with Dreze. It was originally an analysis based on dynamics of hunger and famine. People can starve not because food is not available but because access to food is restricted or constrained by lack of entitlement. An entitlement was viewed as a legal entitlement to a bundle of commodities including food. If it is individual or direct entitlement, trade entitlement failure can be a situation where people in famine cannot have access to food, which is available in another place or under different macroeconomic conditions. The approach has shifted the attention to food security from availability only to accessibility.

The Sustainability of Livelihoods Approach (SL), which is identified with Chambers (1983) and applies to poverty and human development discourses has become popular with international NGOs dealing with development, such as Care and OXFAM (Solesbury 2003) and supported by some international organisations, such as DfID. The SL has been concerned, just like Sen's, with 'earning a living'. To food security, it has brought in issues of vulnerability, sustainability and coping mechanisms. Vulnerability has been looking at risks, shocks, adverse trends and seasonality and even external shocks that can be caused by economic, political and ecological stresses. Sustainability is all about resilience to vulnerability and recovering now and in future. Coping mechanisms are steps that a household takes to address the issue of food availability. Thus, the SL approach has been ahead of others as a long-term perspective of food security.

Besides the approaches that shape how scholars view food security, an important aspect of overall security discourse has emerged. Security used to be confined to nations, borders and property. It is often meant to address violence and war. Today, security has been taken to include problems that people face not only in the form of border conflict or among groups under instances of civil war but also those due to lack of equilibrium between a given population and its food security. The concept of food security is understood as its availability and accessibility to communities and, thereby, demystify it and to project a long-term and preventive sense of security which is more holistic.

Finally, food security is generally an important measure of human development. Through MDG 1c, it has become universally acceptable to look at how people have been fairing on the food security indicators (Box 1) as a measure of moving towards a better-developed world. MDG1 c has been on the rate of undernourishment and malnutrition. But, so also is the fact that it is an important metric of how countries have addressed poverty, which is the MDG 1 generally. An interesting approach whose indicators are used in the next section is the human development approach (UNDP 2012).

Generally, it can be seen that food security is dynamically linked to various aspects of the economic, political and social body of a country. One model on the interrelations is represented by the FAO as indicated in Figure 1.

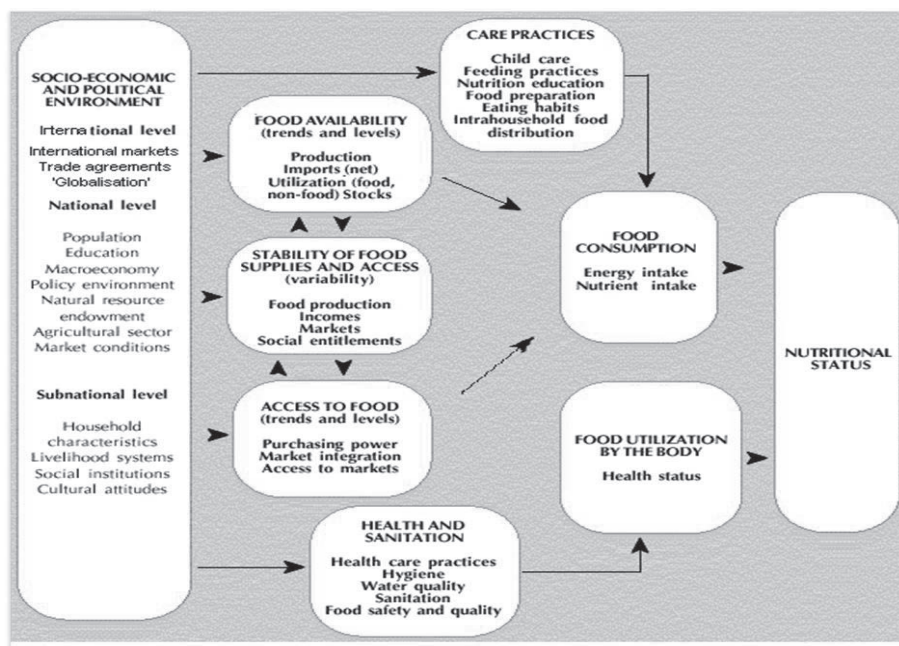


Figure 1. Complex Interlinkages with Food Security

SOURCE: DfID (2004, as adapted in FAO undated)

Whichever is the epistemology of food security, hunger and famine remains a global threat to human kind. There has been some positive change of food security conditions at the global level, but the problem is still a major hindrance to development, especially in the developing world as a whole and to Asia and Sub-Saharan Africa in particular. FAO (2015) points out that there are 795 million food-poor in the world; this size of the food-poor is 216 million less than in 1990. There has been a decline in food insecurity. Undernourishment has gone down from 23.3 to 12.9 per cent in MDGs and 72 out of 129 developing countries have reached the MDG target 1c.

Availability

Average dietary energy supply adequacy

Average value of food production

Share of dietary energy supply derived from cereals, roots and tubers

Average protein supply

Average supply of protein of animal origin

Access

Percent of paved roads over total roads

Road density

Rail lines density

Gross domestic product per capita (in purchasing power equivalent)

Domestic food price index

Prevalence of undernourishment

Share of food expenditure of the poor

Depth of the food deficit

Prevalence of food inadequacy

Stability

Cereal import dependency ratio

Percent of arable land equipped for irrigation

Value of food imports over total merchandise exports

Political stability and absence of violence/terrorism

Domestic food price volatility

Per capita food production variability

Per capita food supply variability

Utilisation

Access to improved water sources

Access to improved sanitation facilities

Percentage of children under 5 years of age affected by wastage

Percentage of children under 5 years of age who are stunted

Percentage of children under 5 years of age who are under weight

Percentage of adults who are under weight

Prevalence of anaemia among pregnant women

Prevalence of anaemia among children under 5 years of age

Prevalence of vitamin A deficiency in the population

Prevalence of iodine deficiency

Box 1. The Disaggregated Indicators of Food Security

SOURCE: FAOSTAT (2015)

3. Regional Analysis

As noted in the introduction, Eastern and Southern Africa were selected not only in relation to the theme of the book but also coincidentally as the areas where ensuring food security has perhaps become relatively more challenging. But, and noteworthy, the FAOSTAT of Eastern and Southern Africa is broader than the normal reference to East Africa and the Horn. Thus, countries in focus are 10 for which 10 indicators are used to

demonstrate the magnitude and drivers of food security. The countries which predominantly fall under the FAOSTAT database are selected on the bases of availability of data for the years 2000 to 2015. The selection includes some of the rapid developing economies of Uganda, Rwanda and Ethiopia in addition to countries that are known to have faced food security problems due to geographical location, and internal and external conflicts. These are the most conflict-ridden regions with arid and semi arid climatic zones.

The dates (2000 to 2015) selected for availability of data coincide with MDGs and have a range that makes comparison manageable. The indicators used for the comparison from the FAOSTAT (2015) indicators of food security (Box 1) are grams *per capita* per day of animal protein consumed (Table 1) and average food production *per capita* using 2004–2006 international price index. The food access indicators used are GDP *per capita* at PPP 2011 international \$, prevalence of undernourishment, depth of food deficit, prevalence of food inadequacy and per cent of land equipped for irrigation. Also, *per capita* food variability index, political stability including violence and terrorism and the percentage of stunted children were among the indicators.

Table 1. Animal protein consumption *per capita* per day in grams

	2000-02	2001-03	2002-04	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11
Ethiopia	6	7	7	7	7	7	7	8	8	8
Kenya	15	15	16	17	17	17	17	17	17	17
Malawi	4	4	4	4	4	5	5	5	6	6
Mauritius	34	35	36	37	36	37	37	39	39	39
Mozambique	5	5	5	5	5	5	5	5	5	6
Rwanda	4	4	4	4	4	5	5	5	5	5
Sudan	31	32	32	32	32	32	31	30	30	30
Uganda	9	9	10	11	12	12	12	12	12	12
Tanzania	9	9	10	10	10	10	10	10	10	10
Zambia	10	10	10	10	9	9	9	9	9	10
Zimbabwe	10	10	10	11	11	11	11	11	12	12
SSA	11	11	11	12	12	12	12	12	12	13

SOURCE: FAOSTAT (2015)

Table 1 shows the animal protein consumed in grams per person per day. In other words, this would be as good as saying ‘how often do people consume meat?’ The average amount of the daily consumption is about 46 grams (<http://authoritynutrition.com/how-much-protein-per-day/> viewed on 8/8/15). This shows that none of the countries reach this requirement per day. But, most important is to look at the change over the last 15 years. Mauritius has the highest per capita consumption followed by Sudan. But, it is worth noting that Sudan has not realised a positive change between 2000 and 2012. The rest of the countries in the region with the exception of Kenya have fallen below the Sub-Saharan African (SSA) average. The rate of animal protein consumption of Uganda has gone up considerably from a low base but has not managed to surpass the SSA average (Fig. 2). Food security in this sense still remains to be a challenge.

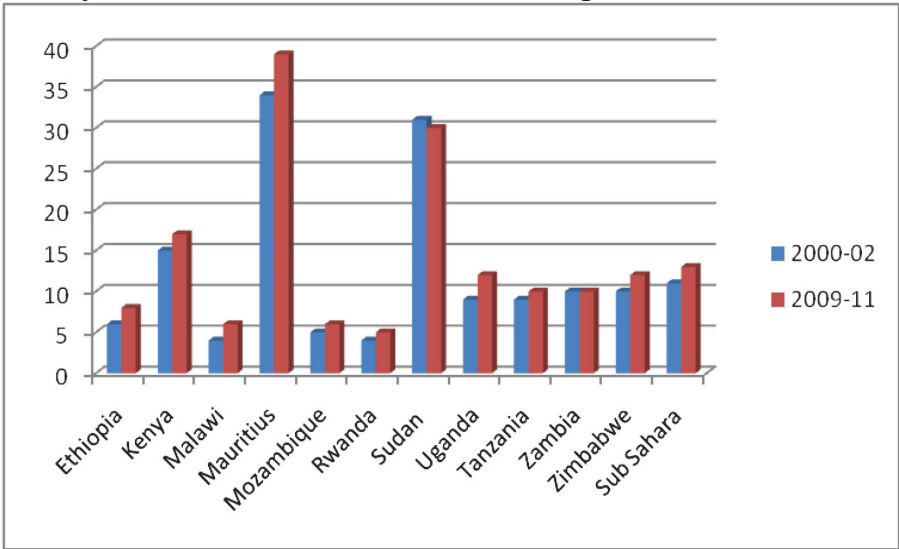


Fig. 2. Change in Animal Protein Per Capita Per Day

SOURCE: Constructed by author based on data from FAOSTAT (2015)

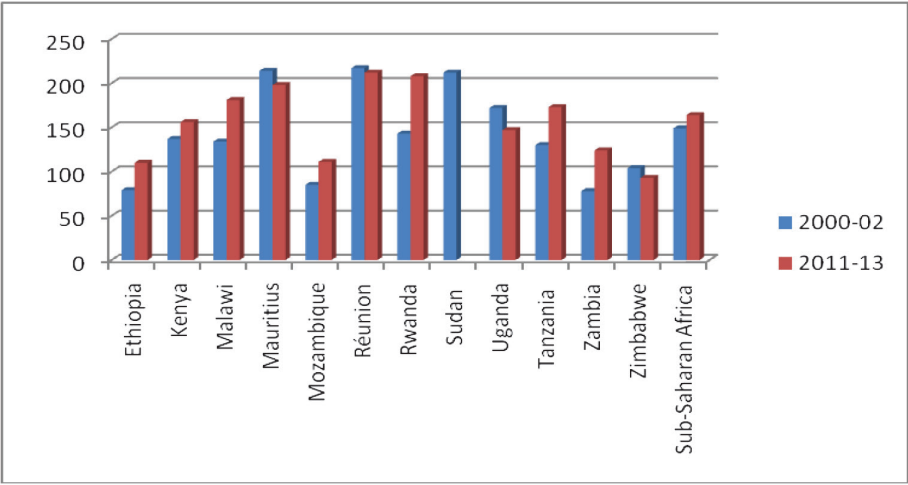
The other challenge is food production as an indicator of food supply expressed as production per capita in US\$ 2004–2006 rates. Table 2 reveals different figures over the years from 2000 to 2013. But a better picture is given by the changes over the period. For 2011–2014, only five countries have surpassed the SSA average. These are Tanzania, Rwanda, Mauritius, Reunion Island and Malawi (Table 2).

Concerning change in food production in value per capita (Figure 3), Rwanda, Tanzania, Ethiopia, Malawi, and Mozambique performed very well for the period 2011–2013 compared to for 2000–2002.

Table 2. Average food production per capita in US \$

Country	2000-02	2001-03	2002-04	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11	2010-12	2011-13
Ethiopia	79	83	86	89	92	93	95	97	102	106	110	110
Kenya	137	141	142	148	155	161	161	162	164	163	161	156
Malawi	134	128	120	117	122	133	148	158	161	167	172	181
Mauritius	214	217	213	215	212	203	201	202	206	207	202	198
Mozambique	85	87	87	85	83	83	84	85	94	105	112	111
Reunion	217	214	216	218	218	210	209	207	212	212	212	212
Rwanda	143	145	150	148	151	155	158	168	181	194	202	208
Sudan	212	222	223	225	222	219	214	209	202	203		
Uganda	172	175	175	171	166	162	159	158	158	156	152	147
Tanzania	130	132	139	136	144	146	147	144	150	158	169	173
Zambia	78	80	81	83	84	84	84	92	105	119	124	124
Zimbabwe	104	100	100	100	101	97	97	92	91	93	95	93
SSA	149	150	153	155	157	157	158	157	161	161	164	164

SOURCE: FAOSTAT (2015)



SOURCE: Constructed by author based on data from FAOSTAT (2015)

Table 3 is on GDP per capita and the indicator focuses on the demand side of food security and access. The per capita income gives a rough picture of the ability to purchase food and is consistent with the entitlements approach briefly reviewed earlier. Clearly, countries that are better off economically, namely, Mauritius and Seychelles which fall in the category of ‘middle income’ have exceptionally high GDP per capita. The rest have exceptionally low GDP per capita of less than US \$ 5000 PPP (Table 3 and Figure 4). Only Zambia, and to some extent Kenya, have GDP of about the same or closer to the Sub-Saharan average. The Eastern and Southern African countries, as pointed out, are relatively poor as a result of which accessibility to food is limited. This could even be more mystical to countries like Ethiopia and Rwanda that have recorded overall high and rapid GDP growth at macroeconomic level (Figure 4).

Table 3. GDP per capita in PPP 2011 international US \$ value

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Ethiopia	623.0	655.6	646.6	614.6	678.5	737.8	795.5	863.0	930.8	986.3	1081.3	1171.3	1240.2	1335.7
Kenya	2143.2	2165.9	2120.1	2124.0	2172.9	2240.1	2318.9	2415.7	2357.5	2371.2	2502.4	2584.9	2628.0	2705.3
Malawi	632.4	585.3	580.1	596.4	608.9	609.0	603.7	641.4	674.0	713.0	737.3	747.3	739.9	755.0
Mauritius	11352.6	11553.2	11715.7	12056.5	12669.6	12751.1	13192.7	13907.7	14619.7	15018.3	15596.9	16179.3	16650.8	17145.8
Mozambique	582.5	634.1	671.0	691.6	731.4	773.2	800.1	835.8	861.1	893.4	932.8	977.1	1020.4	1069.6
Rwanda	764.0	795.7	880.3	879.5	927.6	973.3	1037.7	1086.6	1173.1	1210.3	1262.0	1323.5	1400.4	1426.4
Seychelles	18341.9	17909.7	17585.9	16730.5	16312.7	17696.0	19032.3	20841.2	19944.0	19646.0	20240.8	22424.8	22828.8	23798.8
Uganda	1041.6	1060.1	1114.6	1147.2	1184.3	1217.3	1303.8	1366.7	1436.7	1489.9	1515.2	1606.9	1622.5	1620.6
Tanzania	1476.9	1526.4	1594.2	1659.8	1742.3	1819.7	1881.1	1965.2	2014.7	2060.9	2127.0	2227.1	2271.9	2364.7
Zambia	2201.8	2260.4	2303.7	2402.9	2507.4	2619.6	2751.9	2901.0	3039.4	3224.3	3450.8	3557.4	3677.8	3799.5
Zimbabwe	2520.6	2540.0	2304.2	1907.7	1794.1	1689.3	1629.1	1567.6	1286.2	1352.1	1484.2	1625.9	1749.8	1733.3
SSA	2401.8	2429.5	2452.6	2507.9	2754.2	2826.9	2941.5	3059.5	3144.0	3156.2	3253.2	3317.6	3351.6	3420.0

SOURCE: FAOSTAT (2015)

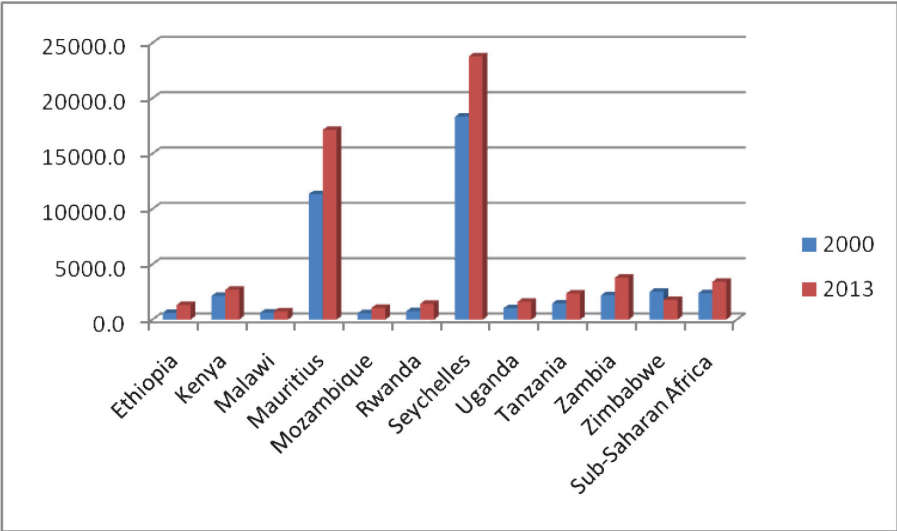


Figure 4. GDP per capita in PPP 2011 international US \$ value
SOURCE: Constructed by author based on data from FAOSTAT (2015)

Table 4 shows data on prevalence of food inadequacy where Mauritius, a middle income country, has the lowest percentage, and for all the years the figure has been less than 6 per cent of the population. Relatively better-off countries by percentage of less than 30 are Uganda and Malawi and Sudan for the years the data is available. These are the only countries with averages less than the SSA average between 2000 and 2015.

The prevalence of food inadequacy in the region is an indication of the food security challenge today. From Figure 5 on changes over the last 15 years, all countries except Zambia have seen a drop in the prevalence of food inadequacy. Mauritius, Malawi and Kenya showed higher reductions in prevalence of food inadequacy compared to the Sub-Saharan Africa. Ethiopia, Rwanda and Mozambique showed very significant rate of decline in the prevalence of food inadequacy. However, in a word, prevalence of inadequate food supply is still a pressing problem.

Table 4. Prevalence of food inadequacy as per cent of the population

Country	2000-02	2001-03	2002-04	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11	2010-12	2011-13	2012-14	2013-15	2014-16
Ethiopia	54.8	51.9	49.9	47.8	45.9	43.8	42.4	41.1	39.5	37.6	36.0	34.9	33.9	33.1	32.0
Kenya	32.3	33.1	34.4	34.0	31.8	28.2	26.3	25.7	25.7	24.8	23.8	22.8	22.1	21.5	21.2
Malawi	27.0	26.6	27.3	27.9	27.7	26.4	24.6	23.1	22.2	21.8	21.3	21.0	20.8	20.8	20.7
Mauritius	6.7	6.4	6.1	5.8	5.6	5.4	5.3	5.2	5.1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Mozambique	42.1	41.3	39.7	38.2	37.3	36.9	36.0	35.0	33.3	31.8	29.9	28.5	27.2	26.2	25.3
Rwanda	54.3	49.0	46.0	46.0	46.7	46.4	45.2	42.8	40.1	37.3	35.4	34.3	33.6	32.7	31.6
Sudan	27.2	26.1	25.5	25.4	25.3	25.0	24.4	24.1	24.2	24.3					
Uganda	28.1	27.2	25.3	22.9	21.9	22.3	23.7	24.8	25.3	25.1	24.8	24.8	25.0	25.3	25.5
Tanzania	37.1	37.8	37.7	37.7	36.7	35.4	34.2	33.8	34.5	34.7	34.7	33.4	32.7	32.1	32.1
Zambia	45.4	47.1	48.2	48.5	49.4	50.7	52.5	53.5	53.1	51.7	50.3	49.4	48.8	48.4	47.8
Zimbabwe	43.7	43.2	42.8	42.5	41.6	40.4	38.6	37.3	36.0	34.7	33.5	33.2	33.5	34.0	33.4
SSA	30.0	29.6	29.1	28.3	27.5	26.5	25.9	25.5	25.1	24.5	24.1	23.6	23.4	23.3	23.2

SOURCE: FAOSTAT (2015)

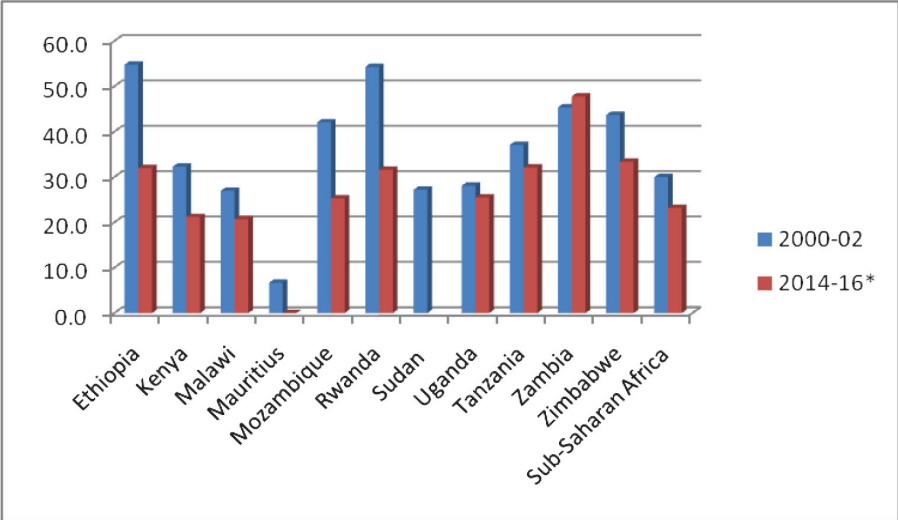


Figure 5. Food Inadequacy Change in Eastern Africa as Per cent of the Population between 2000 and 2015

SOURCE: Constructed by author based on data from FAOSTAT (2015)

With regard to the depth of food deficit, Mauritius had the lowest and Ethiopia the highest rate in 2000 (Table 5). By 2015, Ethiopia is dramatically overtaken by Tanzania, Zambia and Zimbabwe. In fact, the depth of food deficit went up in Zambia over the years (Figure 6).

Table 5. Depth of food deficit in Kcal per capita per day

Country	2000-02	2001-03	2002-04	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11	2010-12	2011-13	2012-14	2013-15	2014-16
Ethiopia	424	395	375	357	341	324	314	304	291	276	264	256	250	244	236
Kenya	217	224	234	231	213	185	170	166	165	159	151	145	140	136	135
Malawi	183	181	186	191	189	180	166	155	149	145	141	140	139	139	139
Mauritius	47	45	43	41	39	38	38	37	37	35	35	36	36	36	35
Mozambique	325	317	302	287	277	273	266	258	244	231	216	205	195	188	181
Rwanda	417	369	345	348	357	357	346	324	301	276	260	251	247	240	232
Sudan	185	178	174	174	175	173	169	168	169	176					
Uganda	194	187	171	151	143	145	156	164	168	167	165	166	167	170	172
Tanzania	270	277	278	280	273	263	254	251	257	259	258	248	241	237	238
Zambia	350	368	384	391	405	422	444	457	455	442	429	421	415	411	405
Zimbabwe	348	345	341	338	331	319	303	290	278	267	256	255	259	264	259
SSA	221	219	216	212	206	199	196	193	191	187	183	179	178	177	178

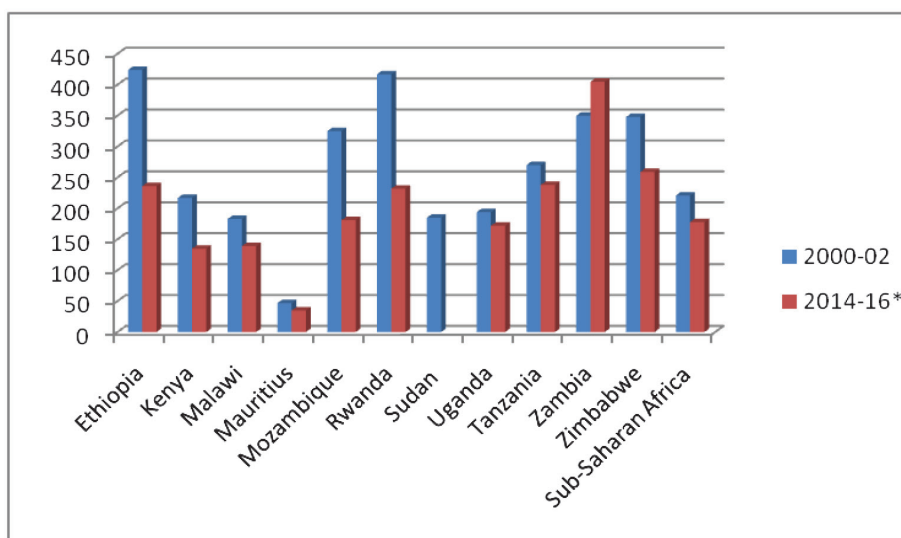


Figure 6. Change in Depth of Food Deficit

SOURCE: Constructed by author based on data from FAOSTAT (2015)

Only six countries of Zimbabwe, Zambia, Tanzania, Rwanda, Mozambique and Ethiopia have averages higher than the SSA average. However, this still leaves a challenge as the daily calorie requirement is somewhere more or less than 2000 Kcal. No country is on average near the rate. (<http://health.howstuffworks.com/wellness/food-nutrition/facts/question457.htm>).

Regarding stability in food security, there is chronic food poverty and transitory food poverty related to production by season and by years (Table 6). The basic index is 100 for the year 1999–2000. Most figures for most countries are lower or negative to as low as less than 15. In fact, the country with relatively less indices is Rwanda until the year 2006. There is less variability with Tanzania for the most recent figures through 2010. The highest variability was seen with Ethiopia, Sudan and Zimbabwe up to 2010 when data is available. But, the situation is a general indicator of challenges of food security for the entire region.

From political stability derived from disaggregated data on Food Security the index ranges from -2.5 for very weak to 2.5 for very strong. A scan of countries in the selected region reveals a lot of negative measures for many years for several countries, notably Ethiopia, Kenya, Rwanda, Somalia, Uganda, Tanzania and Zimbabwe (Table 7). No country has large positive and absolute figures. The simple message is where there is political instability, violence and possibly terrorism are likelihood to aggravate food insecurity. The region has generally not been politically stable with a possible source of food security shocks. Political stability in the region cannot be said to be good and the likelihood of food insecurity, because of this, is still visible from the data.

Table 6. Per capita food production variability index

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ethiopia	16	17	16	12	21	24	23	33	31	30	19
Kenya	19	18	33	48	42	56	61	60	54	42	32
Malawi	35	27	41	63	73	66	31	28	33	26	7
Mauritius	26	22	21	20	21	19	18	25	34	44	54
Mozambique	25	40	35	27	25	42	42	47	29	26	33
Rwanda	48	66	109	98	68	66	72	34	21	33	36
Sudan	17	11	17	17	19	19	19	15	14	9	16
Uganda	59	46	28	50	45	35	31	49	48	39	21
Tanzania	34	34	38	51	54	57	57	70	37	43	60
Zambia	36	31	30	38	33	34	25	37	36	40	44
Zimbabwe	24	24	21	19	17	23	29	31	29	32	21

SOURCE: FAOSTAT (2015)

Table 7. Political stability

Country	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Ethiopia	-1.28	-1.43	-1.27	-1.66	-1.71	-1.76	-1.71	-1.62	-1.62	-1.50	-1.54	-1.52
Kenya	-1.25	-1.28	-1.07	-1.27	-1.12	-1.27	-1.38	-1.43	-1.17	-1.24	-1.32	-1.11
Malawi	-0.08	0.00	0.09	0.08	0.11	0.06	-0.06	0.05	0.06	-0.07	0.00	-0.02
Mauritius	0.05	0.99	0.97	1.00	0.74	0.83	0.85	0.66	0.58	0.94	0.96	0.95
Mozambique	0.12	0.21	-0.03	0.12	0.49	0.30	0.34	0.59	0.34	0.30	0.34	-0.02
Rwanda	-1.78	-1.16	-1.17	-0.97	-0.68	-0.31	-0.30	-0.47	-0.20	-0.14	-0.20	-0.01
Senegal	0.84	0.63	0.67	0.94	0.92	0.82	0.77	0.62	0.88	0.96	0.76	0.81
Uganda	-2.53	-2.67	-2.93	-2.75	-2.78	-3.24	-3.31	-3.32	-3.11	-3.07	-2.85	-2.71
Tanzania	-1.49	-1.60	-1.30	-1.43	-1.16	-0.96	-0.91	-0.99	-1.01	-0.99	-0.88	-0.81
Zambia	-0.35	-0.88	-0.65	-0.57	-0.33	-0.35	-0.21	0.07	-0.02	-0.05	0.02	-0.11
Zimbabwe	-0.35	0.17	0.15	0.07	0.36	0.34	0.46	0.53	0.46	0.47	0.61	0.31
Zimbabwe	-1.60	-1.14	-1.26	-1.24	-0.91	-1.11	-1.20	-1.16	-1.12	-0.96	-0.79	-0.61

SOURCE: WDI (2015)

Another aspect of food security is nutrition. Lack of adequate nutrition is mostly visible among children. An indicator used in the FAO database on food security is the percentage of stunted children as presented in Table 8. Due to the unreliability of available data for some years, it is possible to predict that malnutrition could be a challenge for some countries. Overall, a decline in the percentage is noticeable between 2000 and 2014 for countries like Ethiopia, Malawi, Rwanda and Zambia while it is still considerably high in other countries over the years, at times rising up to 40 per cent.

The previous indicator was a measure of utilisation of food. Another measure used in this article is the percentage of pregnant women as indicated under Table 9. Again there is a general decline, but very marginally (see Figure 7). With the exception of Rwanda, the figures are also very high over the years.

Table 8. Percentage of stunted children

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Ethiopia	57.4	-	-	-	-	50.7	-	-	-	-	-	44.2	-	-	40.4
Kenya	41.0	-	-	35.8	-	40.9	-	-	-	35.2	-	-	-	-	-
Malawi	54.6	-	-	-	52.5	-	53.2	-	-	48.8	47.8	-	-	-	42.4
Mozambique	-	49.6	-	47.0	-	-	-	-	43.7	-	-	43.1	-	-	-
Rwanda	48.3	-	-	-	-	51.7	-	-	-	-	44.3	-	-	-	-
Somalia	29.2	-	-	-	-	-	42.1	-	-	-	-	-	-	-	-
Uganda	44.8	-	-	-	-	-	38.7	-	-	-	-	33.7	-	-	-
Zambia	-	-	52.5	-	-	-	-	45.8	-	-	-	-	-	-	-
Zimbabwe	-	-	-	-	-	35.8	-	-	-	35.1	32.3	-	-	-	27.6

SOURCE: FAOSTAT (2015)

Table 9. Percentage of pregnant women with anemia

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Ethiopia	36.5	35.9	35.2	34.3	33.3	32.1	30.7	29.2	27.6	26.0	24.4
Kenya	51.9	50.9	49.9	48.7	47.3	45.9	44.3	42.6	40.9	39.2	37.5
Malawi	47.4	47.0	46.5	45.8	45.1	44.3	43.4	42.3	41.2	39.9	38.6
Mauritius	38.4	37.9	37.4	36.9	36.3	35.6	34.8	34.0	33.1	32.2	31.3
Mozambique	51.7	51.5	51.2	50.9	50.7	50.4	50.0	49.7	49.3	48.9	48.5
Rwanda	26.2	25.9	25.5	25.1	24.5	23.9	23.1	22.3	21.5	20.7	20.0
Somalia	48.6	48.5	45.4	44.9	44.2	43.4	42.4	41.1	39.6	38.0	36.2
Uganda	46.2	45.8	45.4	44.9	44.2	43.4	42.4	41.1	39.6	38.0	36.2
Tanzania	56.2	56.1	55.9	55.7	55.4	55.0	54.4	53.8	53.1	52.3	51.4
Zambia	44.6	43.9	43.2	42.5	41.7	40.9	40.0	39.1	38.2	37.3	36.4
Zimbabwe	32.5	32.9	33.4	33.8	34.3	34.6	34.7	34.7	34.7	34.5	34.4

SOURCE: FAOSTAT (2015)

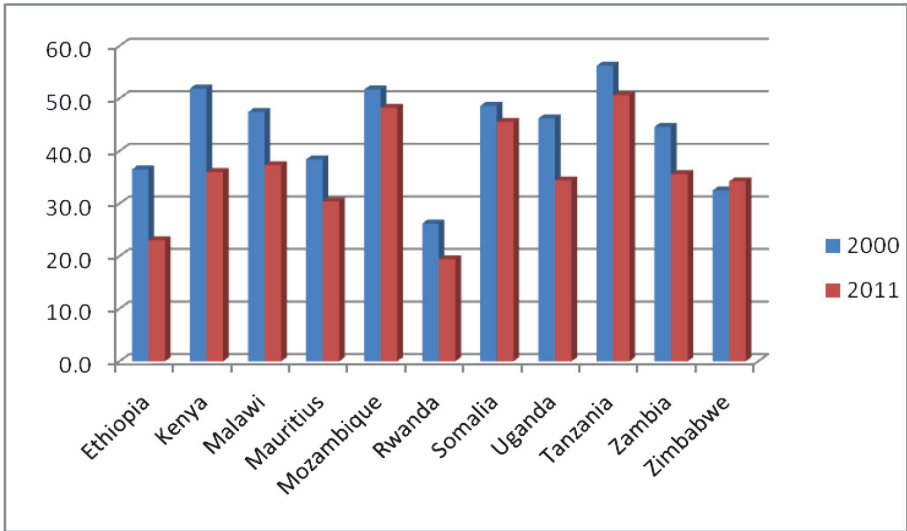


Figure 7.Change in Per cent of Pregnant Women with Anemia

SOURCE: Author’s construction based on data from FAOSTAT (2015).

Countries could vary in their area and size of population. But, what matters is the rate of population growth in relation to food production, a phenomenon addressed under the conceptual framework of this chapter. Ethiopia started off with 68 million and will have reached 99 million by 2016 (Table 10). Mauritius is put at 1.2 million in 2000 and only 1.3 in 2016, registering no significant population growth over the past five years. What is critically important to this chapter is the rate of change in the growth of the population. As shown in Figure 8, Ethiopia has the highest change followed by Uganda and Zambia, Kenya and Zimbabwe. Population growth continues to impact the capacity of countries in the region to feed themselves, whatever sense food security is understood (Bremner 2012).

Table 10. Population in millions of people

Country	2000-02	2001-03	2002-04	2003-05	2004-06	2005-07	2006-08	2007-09	2008-10	2009-11	2010-12	2011-13	2012-14	2013-15	2014-16
Ethiopia	68.0	70.0	72.0	74.1	76.2	78.3	80.5	82.6	84.9	87.1	89.4	91.7	94.1	96.5	99.0
Kenya	32.1	33.0	33.9	34.8	35.8	36.8	37.8	38.8	39.8	40.9	42.0	43.2	44.4	45.5	46.8
Malawi	11.6	11.9	12.2	12.6	12.9	13.3	13.7	14.1	14.6	15.0	15.5	15.9	16.4	16.8	17.3
Mauritius	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.3
Mozambique	18.8	19.3	19.9	20.4	21.0	21.6	22.2	22.8	23.4	24.0	24.6	25.2	25.8	26.4	27.0
Rwanda	8.7	9.0	9.1	9.3	9.4	9.7	9.9	10.2	10.5	10.8	11.1	11.5	11.8	12.1	12.4
Somalia	7.6	7.8	8.0	8.3	8.5	8.7	8.9	9.1	9.4	9.6	9.9	10.2	10.5	10.8	11.1
Uganda	25.1	26.0	26.8	27.8	28.7	29.7	30.7	31.8	32.9	34.0	35.2	36.4	37.6	38.9	40.2
Tanzania	34.9	35.8	36.8	37.8	38.8	40.0	41.1	42.4	43.7	45.0	46.4	47.8	49.3	50.8	52.3
Zambia	10.4	10.6	10.9	11.2	11.5	11.8	12.1	12.5	12.8	13.2	13.6	14.1	14.5	15.0	15.5
Zimbabwe	12.6	12.6	12.7	12.7	12.7	12.7	12.7	12.8	12.9	13.1	13.4	13.7	14.2	14.6	15.0

SOURCE: WDI (2015)

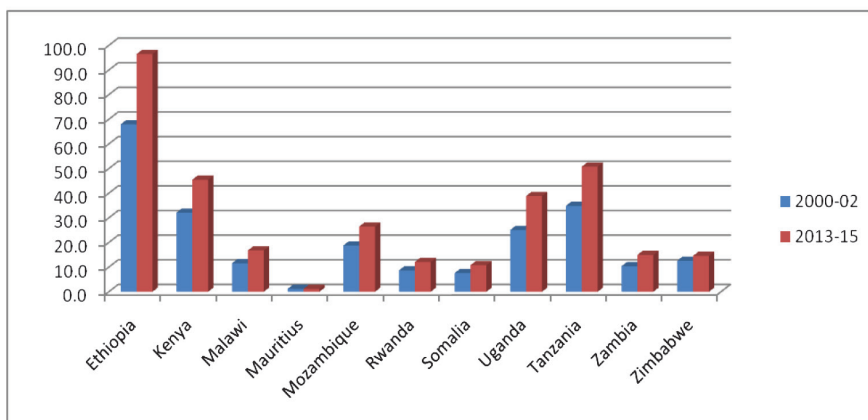


Figure 8. Change in Population

SOURCE: Constructed by Author based on data from FAOSTAT (2015)

4. Rwanda LUC as an Institutional and Social Innovation for Food Security

The Rwandan case study could already be gleaned from the numbers in tables and shapes in diagrams. The real issue is how the figures and tables are interpreted in the evolution of policy statements. The Land Use Consolidation in Rwanda provides a contextual case of institutional innovation and its impact on food security. But, from recent findings from the study in question, it became clear that a generalised and macroeconomic reading of findings can obscure the specific patterns of food security as emphasised by the disaggregation of FAO database. Thus, the gaps that occurred between findings and the actual position are deliberate or lack of disaggregate analysis of the situation. In this section, it is shown that LUC was an institutional innovation that led to gains in agricultural productivity and food security. On the other hand, the uproar that findings wrongly portrayed food insecurity in Rwanda in other studies could be explained by the importance of looking at food security in its entirety which provides lessons on policies for the sustainability of innovations in land use which have already made concrete contributions.

But, the real innovation in LUC of Rwanda derives from the geophysical and economic context of the country. Rwanda is a small country in central Africa. It has a land area of 16,388 square kilometres slightly larger than the province of Maryland. It is famous for a genocidal war that was fought in 1994 destroying the national economy and leading to new challenges of food insecurity. But, even before the genocide, food security was a persistent problem. In the 1980s, the growth rate in the agricultural sector was negative and less than 1 in the 1990s. With the highest density of population and limited land for cultivation in the 1990s, Rwanda could

hardly increase yield or productivity by cultivating more land. For some, Rwanda had entered the Malthusian trap (Andre and Plateau 1996) and for others, Rwanda had defied the Boserup hypothesis (Boserup 1965).

Thus, it has been reiterated that consolidation is related to the use of land. In many parts of the world, different forms of land consolidation from time immemorial have been a method of tapping economies of scale. This is operationally the principal rationale although some scholars prefer to focus on specific government goals, such as agricultural transformation (GoR 2007a and b), more ambitiously referred to as 'Green Revolution' (Ansoms 2008), food security or more modestly food self-sufficiency (Mbonigaba and Dusengemungu 2013), and in quite radical discourses as 'consolidation of power' into the hands of the state (Huggins 2012). Across all these, LUC in Rwanda is both a land and agricultural issue. In principle, LUC has its origin in the Rwandan Land Law and Policy (GoR 2004; 2005); and in practice, it is part of agricultural transformation (GoR 2007; 2008). Land Use Consolidation is part of the Crop Intensification Programme (CIP) established a year earlier. Vision 2020 and Poverty Reduction Strategy Paper, both published in 2002, were clearly intended to transform Rwandan economy and to encourage good use of land for agricultural development so as to lead Rwanda to a middle-income country by 2020. In 2009, a Strategic Plan for agricultural transformation Phase 2 was designed for 2009 to 2012 to coincide with the conclusion of the Economic Development and Poverty Reduction Strategy (GoR 2009a and b). LUC was an innovation by using land differently and organising production and settlements to boost productivity per unit area and optimise food availability.

The Organic Land Law No. 08/2005 of 14 July 2005 had defined Land Consolidation as, "A procedure of putting together small plots of land in order to manage the land and use it in an efficient manner so that the land may give more productivity" (*Official Gazette of the Republic of Rwanda*, Year 44 no. 18, 15 September 2005, 8). The CIP was initiated in September 2007 to increase the agricultural productivity of high potential food crops and to provide Rwanda with greater food security and self-sufficiency. Priority crops are maize, wheat, rice, Irish potato, cassava, beans, soybeans and bananas. Selection of which crop to cultivate in which area and rotation system had to be done through consultations with the local leaders and according to agro-ecological zones. Targets were set in relation to performance contracts. So far farmers join their plots and operate in the form of cooperative to receive support and technical services from the government.

The area under LUC has expanded from 28,016 ha in 2008 to more than 602,000 ha in 2012 (Mbonigaba and Dusengemungu 2013) and the target was to reach 70 per cent of the population by 2017 (GoR 2011). Figure 9 shows that every district of Rwanda has adopted the innovative LUC though to different levels of land coverage.



Figure 9. Districts of Rwanda that Have Adopted the Innovative LUC

LUC is meant to ensure food security but is also linked to commercialisation and resettlement of Rwandan households. So far, productivity has been dramatic. Yield of maize went up 5 times, wheat and cassava 3 times, Irish potatoes, soybeans and beans 2 times and rice by 30 per cent. According to government, food security needs have been met by the programme (Mbonigaba and Dusengemungu 2013). The challenge was how to handle the surplus (Kathiresan 2012). At macro-economic level, the innovation had worked to lead to food self-sufficiency.

The macroeconomic scenario is supported by the findings of a study carried out at sub-national level involving 748 households in different agro ecological zones (Musahara *et al.* 2014; Rwandaland 2015). At perception level, the farmers involved in the innovation were satisfied with the scheme in various aspects and across all the parts of the country (Table 11).

Data from both the focus group discussions and the household survey cited in the study findings suggest that satisfaction with LUC was quite high. Nearly two-third of the farmers reported that they were “very satisfied” with LUC which had a large and positive impact on their families. From the account of the heads of households, about 61.3 per cent or 455 households had responded that the yield had gone up after joining the LUC programme than before. Farmers reported very high level of satisfaction with LUC.

Farmers are generally positive about LUC and in addition, land productivity as measured in value of output per hectare is substantially higher among LUC farmers compared to farmers in other countries in the region. All of the farmers included in the household survey reported using improved seeds, while over three-fourths used fertiliser (either organic or chemical).

Table 11. LUC impacts on yield as perceived by farmers from different districts of Rwanda

District	More %	Same %	Less %	N
Burera	33	20	47	30
Gicumbi	57	17	27	60
Musanze	67	5	29	60
Rulindo	57	10	33	30
Gakenke	90	3	6	31
Nyaruguru	89	3	8	38
Ruhango	89	7	4	27
Bugesera	74	22	4	23
Rwamagana	79	17	3	9
Ngoma	11	42	47	36
Gatsibo	63	9	28	68
Kirehe	73	18	9	67
Nyamasheke	100	0	0	33
Nyabihu	68	14	19	59
Rusizi	10	0	0	31
Huye	96	4	0	25
Kayanza	0	0	100	1
Total	70	12	19	65.4

SOURCE: Musahara *et al.* (2014)

It was also noted that access to subsidised fertiliser and more frequent visits from extension officers were associated with greater satisfaction and higher reported yields under the program. In 2007, about 21,600 tonnes of mineral fertilisers were ordered and 13,260 tons were received and distributed. About 4,200 tonnes of mineral fertilisers were distributed under Crops Intensification Program (GoR 2008). In summary, these are the findings that raised controversies among scholars and sponsors that the findings were too good to be true. “Was the innovation so smoothly successful and is it true that food insecurity has been addressed?” The answer is in the disaggregate data.

Asked about their food security for the last 7 days, about 66.7 per cent of the farmers indicated inadequacy of food of various forms. For instance, 49.7 per cent indicated that, in the last 7 days, there were days they had less preferred and less expensive food and out of these, 24 per cent had this problem every day during the last seven days. Noteworthy is that 83.7 per cent of the households noted that they never had to borrow food in the last 7 days and 52.8 per cent of the households indicated that they never had to limit the portion of size at meal times although in some 41.2 per cent about 23 per cent of the households had to limit the size of the portion of meals for 2 to 4 of the days in the previous week. In 71.2 per cent of the households, there was no reduction of consumption of some members, especially adults to enable others especially children have enough to eat.

Some 56.1 per cent indicated that they did not have to reduce the number of meals.

Recalling from September 2012, some 26.5 per cent of the households indicated they had encountered food availability problems. The percentage of respondents that conceded to have had food availability problems was 37.2 in October 2012 and 34.8 per cent in November 2012. The issue here is that the perception on food availability is also temporal and seasonal. Two-thirds of the farmers had reported their household did not have enough to eat in the past week (Table 12). In addition, over half the respondents in the survey had experienced some kind of shock in the previous three years that affected their household's ability to eat or change their asset ownership and farmers exhibit low levels of per capita expenditures consistent with high rates of poverty. Many LUC households continue to struggle to meet basic needs. Moreover, further improvements to the already high levels of land productivity may be difficult to achieve. Thus, true to the different approaches discussed, there is no contradiction. Food security at macro level is not all about food security and its other aspects.

Although a very useful innovation, it was expressed that at the beginning farmers had not well received it. Twenty-four per cent of the farmers in our survey indicated that their participation in LUC was not voluntary, and it was only a 'carrot and stick' technique was used to make them join the scheme if they wanted to be assisted with subsidised inputs and other services. About 45 per cent of the farmers who participated in the survey had not liked the scheme when it was introduced.

Using the same indicator for comparing LUC and non-LUC households, 27 per cent of non-LUC households have only 1 meal a day; this is true for 22 per cent of LUC households. Although those under LUC were better off in relative terms, the 2 households that went without meals the previous day were under LUC although this can be a bias as the LUC households are more numerous. For children under the age of 15 years, there were 20 per cent who had only two meals a day.

Table 12. Indicators of food insecurity

Indicator	Percentage of respondents (%)
Household did not have enough food in the past week	67
Relied on less preferred and less expensive food	50
Borrowed food or relied on help	16
Limited portion size at mealtimes	47
Reduced consumption by adults	29
Reduced number of meals eaten in a day	44

Thus, from the analysis it is clear the scheme was successful and led to increase many fold in food crop production. But, it can be seen that indeed

there was no contradiction with findings at different levels as hinted by the analysis in the conceptual frame. Rwanda had become food self-sufficient as a result of the scheme but food insecurity is still very pervasive. The answer comes from the conceptual analysis undertaken earlier. Food security is not about food availability in general. It is also about access, utilisation and stability. The analysis often looks straight forward and simple but the case study it is clear it can lead to different policy interpretation. Let us note that the interpretations may not be ignorance but political. The disaggregate view may not be used to clear the contradiction but for Rwanda and elsewhere it can be used by those who would like to point out the policy has been ineffective after all. For analysis and good policy lessons it is important to clear the confusion arising from elemental definition of food security but also to assist in pointing out further policy analysis for sustaining well meant innovative solutions. For sustainability of the innovation and policy inferences there are a few more lessons that can be learnt from the LUC initiative in Rwanda.

First it is clear that the scheme is country wide but not equally in all areas of Rwanda. It is limited to few food crops implemented differently in different districts of Rwanda. The simple meaning of this is that the windfall gains from the scheme must be concentrated in only a few of the households certainly below 20 per cent. Meaning the windfall gains are still limited to a relatively few households. The windfall gains are more significant in maize and a few other food crops shown above. It needs to be pointed out that where LUC has been introduced less land is available for cultivating other crops. This needs to be viewed in relation to how different households gain different from the scheme in terms of income and profitability for other crops. It was noted that there are still substantial numbers of households that still experience shocks in livelihoods.

It was also noted in approaches to food security that it should be seen in relation to other sectors and to other need and livelihoods. Farming in remain dominated by rain fed cultivation. It was noted that Rwanda still has only less than 3 per cent LUC farms under irrigation. Rwanda has been recommended on having 78 per cent of farms under soil protection compared to 80 per cent required under CAADP. The soil erosion in one form or another is still rampant. Cultivation is still carried out on steep slopes. There is still water run-off compromising ecosystem integrity and eroding river banks leading to nutrient loading of water bodies (Musahara, 2006, Musahara and Rama 2008). Research carried out has already estimated the loss of soil through Nyabarongo river system to 51kg/second at Kigali level; 44 kg/second at Kanzenze level and 26 kg/s at Rusumo level (GOR 2008).

There are still debates on the extent of using organic fertilisers and environment, especially with regard to water quality. But, ironically it is also not yet established how withdrawal of the input subsidies would affect

the scheme if there was to be limited response from the private sector. This needs to be studied in view of sustaining the innovation.

Storage facilities and processing are part of the services supporting LUC under the Crop Intensification Programme. These are important to ensuring the food availability is sustainable for longer periods and across seasons. However, the study referred to had found inefficiencies in improving these and promoting commercialisation. In the survey, only 21 per cent of the farmers had access to storage and only 9 per cent processed crops after. For commercialisation, it seemed gradually better with over 56 per cent of total output being sold by households. But, above all, the livelihoods of those under the scheme will have been improved. Some 69 per cent of all households indicated that their living conditions had been positively impacted by LUC while only 5 per cent indicated deterioration in living conditions.

Assets can speak on poverty conditions and certainly on access to food. For example, a bicycle is a useful means of communication and transport in rural areas, and households that possess them tend to be relatively better off. Among the households participating in LUC, 22 per cent have at least one bicycle. Dairy cattle are an important sign of wealth in rural Rwanda. About 1.6 per cent of households under LUC have between 4 and 10 dairy cattle. About 30 per cent of households under LUC have at least 1 dairy cattle. Some 14 per cent of LUC households had at least 2 dairy cattle in the household.

5. Conclusion

From the analysis, it is clear that food security is not an elusive concept. What is rather elusive is its interpretation and levels of analysis. The need to improve food security will continue to be important for poverty reduction and meeting international standards and needs calls for more innovations at institutional and social levels. However, it has been seen that innovations at macro and national levels are not supposed to affect and impact households and individuals similarly.

Just like the analysis of the approaches and food security, it is important to view food security in a broader perspective. It is related not only to the agricultural sector but also to other sectors. It is not about supply of food but also the demand for the food by various consumers. It is also considered as a basic human right and an important element of human security. In sum,

- i. the fact that food security is also about access, availability and use should be followed by analysis and policy intervention to ensure food security gains are real at national, regional, household and individual levels.

- ii. Policy follow up will take care of the demand side of food security which has to do with nutrition, access and other entitlements and capabilities of the target communities.
- iii. Innovations are important not only in changing production conditions but also in organisation of land use for food security. These, however, need to be robust to all food security components and to different areas and communities involving all major crops.
- iv. The promotion of food security and innovations should be linked at policy level to other economic, social and livelihood improvement interventions. Sustainable food security innovations and interventions should also be linked to modernisation of agriculture and value addition which lead to non-farm employment and smoothening of long-term food deficits

References

- Andre, C. and Plateau, J-P. 1996. Land tenure under unendurable stress: Rwanda caught in the Malthusian trap. *Cahiers de faculte des science economiques et sociale no. 164*. Namur.
- Ansoms, A. 2008. A green revolution for Rwanda? The political economy of poverty and agrarian change. *Discussion paper 06*. University of Antwerp. Institute for Development Policy and Management
- Boserup, E.1965. *The conditions of agricultural growth. The economics of agrarian change under population pressure*. London: George Allen and Unwin Ltd.
- Bremner, J. 2012. Population and food security. Africa's challenge. *Population Refrence Bureau Policy Brief* viewed on 8.1.2016 <http://www.prb.org/pdf12/population-food-security-africa.pdf>
- Chambers, R.1983. *Rural development: Putting the last first*. London and New York: Routledge.
- FAO. 2015. *The state of food insecurity in the world*. A joint Report with IFAD and IFPRI. Rome. seen online on 9.1.2016. <http://www.fao.org/3/a-i4646e.pdf>
- FAOSTAT. 2015. Food and Agriculture Organisation. Statistics Division. Rome. Seen on 8.1.2016 <http://faostat3.fao.org/home/E>
- GoR. 2002. *Vision 2020*. Kigali: GoR.
- . 2004. *Land Policy*. Kigali: GoR
- . 2005. *Organic Law N° 08/2005 Of 14/07/2005: Determining the use and management of land in Rwanda*. Kigali: GoR.
- . 2007a. *Crop intensification programme..* Kigali: MINAGRI.
- . 2007b. *Economic development and poverty reduction Strategy (EDPRS I)*. Kigali: GoR.

- . 2008. *Strategic plan for transformation of agriculture in Rwanda*. Kigali: GoR.
- . 2009a. *Strategic plan for transformation of agriculture in Rwanda: Phase II*. Kigali: MINAGRI.
- . 2009b. *National post-harvest staple crop strategy*. Kigali: MINAGRI.
- . 2011. *Strategies for sustainable crop intensification in Rwanda: Shifting focus from producing enough to producing surplus*. Kigali: MINAGRI.
- . 2013. *Official special Gazette of 16/6/2013*. www.primature.gov.rw Kigali.
- Huggins, C. 2012. Consolidating land, consolidating control: What future for smallholder farming in Rwanda's "Green Revolution? Cornell Land Project.
- ILO. 1976. Employment, growth and basic needs: World Employment Conference. International Labour Organisation and the Overseas Development Council, Washington, D.C.
- Kathiresan, A. . 2012. *Land use consolidation in Rwanda. An assessment from a perspective of the agricultural sector*. Kigali: MINAGRI.
- Malthus, T. R. 1789. *An essay on the principle of population*. Cambridge: Cambridge University Press . Amazon.Com.
- Maxwell, S. 1996. Food security: A post-modern perspective. *Food security Policy* 21(2): 155–170.
- Maxwell, S, and Devereux, S. 2001. *Food security in Sub-Saharan Africa*..Brighton: ITDG.
- Mbonigaba, M. and Dusengemungu, L. 2013 .*Land use consolidation: A home grown solution for food security in Rwanda*..Kigali: RAB.
- Musahara, H. 2006. Improving land tenure security for the poor in Rwanda. Country Case Study. *LEP Working paper # 7*. Rome: FAO.
- Musahara, H. and Rama, R. 2008. Policy on 'brown water' due to environmental degradation in the Nile Basin. The case of Rwanda. Project Report. Project ID p075952. Nile Basin Initiative. Entebbe
- Musahara, H., Birasa, N., Niyonzima, T., Bizimana, C. 2014. *Land use consolidation and poverty reduction*. A World Bank paper. Washington D.C.
- . 2014. An assessment of impacts of land use consolidation on socio-economic conditions and environment in Rwanda. Final report, AID Land Project. Kigali.
- Rwandaland. 2015. USAID resource for land sector stakeholders in Rwanda. Kigali. A project website <http://www.rwandaland.org/en/landprojectreports>.
- Rowntree. 1901. *Poverty: A study of town life*. (Rpt. 2015). London: Macmillan.
- Sen, A. 1983. *Poverty and famines. An essay on entitlement and deprivation*. New York: Oxford University Press.

- Solesbury, W. 2003. Sustainable livelihoods. A case study of the evolution of DFID Policy. *ODI Working Paper* 217. London.
- Streeten, P. 1981. *Development perspectives*. New York. St Martin's Press.
- Stewart, F. 1985. *Basic needs in developing countries*. John Hopkins University Press.
- UNDP. 2012. Africa development report: Towards a food-secure future. Regional Bureau for Africa. New York.

CHAPTER FOUR

Development of an Interdisciplinary School-Based Intervention to Address Food and Nutrition-Related Needs in Poor Communities in South Africa

Ronél Ferreira, Karien Botha, William Fraser and Peet du Toit

Abstract

In this chapter, we report on the development of a health promotion intervention: Win-LIFE (Wellness in Lifestyle, Intake, Fitness and Environment), which forms part of a broader research project at the University of Pretoria, South Africa. The aim of the broader project is to investigate possible transference of nutrition and environmental knowledge from grade 4 – 6 learners to their families, in order to support households in poor communities achieve food security, health and well-being. The study consists of five phases, uses interpretivism as meta-theoretical lens and relies on Participatory Reflection and Action (PRA) as methodological paradigm. Baseline data were generated through PRA-based workshops with teachers (n=45) and parents (n=23) from three primary schools in a poor South African community. Supplemental data include document analysis, observation, field notes, photographs, posters, audio recordings and reflective journals. Following the inductive thematic analysis of data obtained from teachers and parents, we conducted a focus group discussion with university researchers (n=15) from five faculties, and interviews with researchers (n=2) from the Agricultural Research Council, together with representatives from the National Department of Basic Education (n=2). Findings emphasise the daily food consumption practices within the selected community; the knowledge- and skills-based and nutrition-related needs present in the poor community; the manner in which South African policies, programs and international initiatives could be integrated into the health promotion and education intervention; and discipline-specific content important for inclusion in the intervention. As a result of the selected methodology, the Win-LIFE intervention was developed through interdisciplinary community coalitions. It focuses on nutrition and environmental education, includes classroom-based activities for learners, and home-based assignments for learner-parent pairs. Currently, Win-LIFE is incorporated into the South African Life Skills curriculum (nutrition education) and Natural Sciences curriculum (environmental education) with grade 4 (n=527), grade 5 (n=467) and grade 6 (n=471) learners in the participating schools. As the intervention is still underway, its outcome is yet to be determined.

Keywords: community coalitions, food and nutrition-related needs, food security, interdisciplinary school-based health promotion intervention, participatory reflection and action.

1. Introduction and Background to the Study

Both scientific and non-scientific literature indicates the impact of non-communicable diseases, household food insecurity, malnutrition, hunger and hidden-hunger within Sub-Saharan Africa, more specifically in resource-constrained communities. South Africa counts as one of 36 so-called 'high-burden countries', in terms of the challenges related to malnutrition, as listed by the World Health Organisation (WHO) (Faber, Witten and Drimie 2010). In this regard, South Africa experiences the challenge of chronic, rather than acute malnutrition (Faber and Wenhold 2007), manifesting in both under-nutrition and over-nutrition, together with a range of micronutrient deficiencies. Under-nutrition, especially stunting and micronutrient deficiencies, co-exists with overweight, obesity and associated consequences, such as hypertension, diabetes and cardiovascular diseases (Department of Health 2013). The high prevalence of under-nutrition, micronutrient deficiencies and emergent over-nutrition, within the current context of the HIV and AIDS pandemic and food insecurity, presents a series of complex challenges in this country (Department of Health 2010).

Household food insecurity, malnutrition and non-communicable diseases are challenges that should be prioritised and can be addressed by means of health promotion and education intervention strategies. Such intervention strategies can namely support households with increased food consumption and nutritious individual intakes (safe, sufficient and nutritious food) through increased food production. Given the emphasis by the South African Government and international initiatives on promoting household food security and decreasing the prevalence of malnutrition and non-communicable diseases, it seems imperative to engage with poor communities in developing community-based and action-oriented health promotion interventions.

The National Food Consumption Survey: Fortification Baseline South Africa (NFCS-FB-1) (Department of Health 2005) indicates that households with the lowest monthly income and daily food expenditure are at risk of hunger or experiencing hunger and nutritional problems. Worldwide, malnutrition is associated, directly or indirectly, with 60 per cent of all child deaths (Department of Health 2013; Stephen *et al.* 2011). To this end, South African communities, particularly those with limited resources, face various difficulties, specifically related to HIV and AIDS and Non-Communicable Diseases (NCDs) (Bourne, Lambert and Steyn 2002; Mayosi *et al.* 2009). In addition, difficulties often faced include poverty, unemployment, lack of career opportunities, difficulty in growing foods, and access to water (Sotshongaye and Möller 2000; Taylor and Jinabhai 2001). Furthermore, prenatal and maternal illness and violence are common challenges faced by South African communities (Mayosi *et al.* 2009).

The study we report on forms part of a broad research project situated within and funded by the Institute for Food, Nutrition and Well-being at the University of Pretoria, South Africa. The broad project investigates the potential role of schools as sites for social change in order to facilitate behavioural change within poor communities. An underlying assumption of the broader research project is that if learners were knowledgeable in terms of the importance of nutrition and positive lifestyle behaviour, they could potentially share this knowledge within their family environments and subsequently facilitate change. The broader project thus aims at facilitating change that could improve health and well-being through the development and implementation of a health promotion and education intervention that can address hunger and hidden hunger, improve household food and nutrition security, psychological functioning, adaptation and environmental sustainability. Over time, the effect of the intervention will be monitored and evaluated, with the aim of adapting the intervention and further employing it in other schools and contexts.

In this chapter, we specifically report on the manner in which the developmental process and characteristics of the intervention we developed can potentially inform existing knowledge on health promotion and education interventions. We also discuss the potential role of schools in this regard. We explain the manner in which community coalitions, within a framework of Participatory Reflection and Action (PRA) research, informed and enriched the specific content of the developed health promotion and education intervention. In this regard, the overall aim of the study was to develop a detailed understanding of a specific phenomenon (Patton 2002; Onwuegbuzie and Leech 2007; Creswell 2012) from firstly the community participants' perspectives in their own voices (participants involved in community coalitions) in a specific community (poor community) within a specific context (with high levels of household food insecurity, poverty, unemployment and limited resources), environment (in Gauteng South Africa) and time (February 2013 to March 2015). Secondly, we also included the voices of participants involved in interdisciplinary collaborative partnerships (university researchers, researchers from the Agricultural Research Council and representatives from the National School Nutrition Program at the Department of Basic Education).

Following an in-depth multiple case study design (Yin 2012), we conveniently selected three primary schools from a poor community setting, considering each school (setting) as a case (McMillan and Schumacher 2014). During Phase 1 of the study (February 2013), the community's food consumption practices and nutrition-related needs were explored, as perceived by both intermediate phase teachers (n=45), and parents (n=23) of the school. After analysing the baseline data we obtained, Phase 2 (September 2013) involved member checking and the second round of data collection. During phase 3 of our study (November 2013), we explored professional suggestions from university researchers (n=15) and two government departments (n=4) on guidelines and discipline- specific

content to be included in the health promotion and education intervention we subsequently developed. For phase 4 (January to April 2014), we completed another round of member checking, and then developed the Win-LIFE intervention (Wellness in Lifestyle, Intake, Fitness and Environment), aimed at enriching the current grade 4 to 6 South African intermediate phase school curriculum, and assisting participating schools to become inclusive centres of learning, care and support. During the final phase of the study (August 2014 to June 2015), we finalised intervention manuals (Photograph 1) and trained teachers (n=24) to implement the intervention. The implementation phase is currently underway (Photograph 2) and will be followed by an evaluation of the outcome of the intervention later in 2015 and 2016.



Photograph 1. Intervention manuals



Photograph 2: Implementing the intervention

2. Food Security in South Africa

Internationally, food security exists when “all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life” (Department of Agriculture 2002, 15). Food security implies that all of society has enough food for optimal health and collective well being on a daily basis (Labadarios, Steyn and Nel 2007). It is regarded as a basic socio-economic right (Hyslop 2012). As an umbrella term, household food security, therefore, includes the availability of safe and nutritionally adequate food, as well as the assured ability to acquire acceptable quality food in a socially acceptable manner (Labadarios *et al.* 2009; Malan and Van Rooyen 2010). It follows that national food security can be defined as the condition where a nation has the ability to manufacture, import and sustain food needed to support communities with minimum per capita nutritional standards (Labadarios *et al.* 2009; Anderson 1990). Community food security, therefore, exists when all residents of the community can obtain a safe, culturally acceptable and nutritionally adequate diet by means of a sustainable food system that maximises community self-reliance,

quality of life and social justice (Anderson 1990; Radimer, Olson and Campbell 1990).

According to the Food and Agricultural Organisation of the United Nations (FAO) (2013), food availability, economic and physical access to food, together with food utilisation and sustainability are all dimensions of food security. In urban South African households, accessibility, rather than food availability, pose an immediate threat to food security. Although South Africa as a nation has been classified as 'food secure' (Wenhold *et al.* 2007), it is estimated that 14 million people (about 35 per cent of its population) might be vulnerable to household food insecurity. This means that the country has enough food yet that a large percentage of the population is not able to access available food. Besides the challenge of ensuring access to sufficient food for every South African citizen, the Integrated Food Security Strategy of South Africa (Department of Agriculture 2002) highlights several other food security challenges, namely the challenges of ensuring that enough food will be available for future generations, educating South African citizen to make the correct choices in terms of nutritious and safe food, ensuring that adequate food emergency systems are available in case of natural disasters, and conducting ongoing research on the impact of food security interventions (Department of Agriculture 2002). Oldewage-Theron, Dicks and Napier (2006) found that although food insecurity is not as widespread in South Africa as in other areas of Sub-Saharan Africa, household food insecurity specifically persists in the majority of the black population of the country. The South African Department of Agriculture (2002) indicates that household food insecurity will lead to high medical costs, funeral expenses and low labour productivity. In the South African environment, household food insecurity specifically affects vulnerable people, namely children, women and the elderly (Department of Agriculture 2002).

3. Food Consumption Practices and Nutrition-Related Challenges Faced by Poor South African Communities

Sub-Saharan Africa has the second highest number of underweight children in the world, with those from resource-constrained settings being affected worst (United Nations 2012; 2013). Similarly, Vorster (2010) notes an inter-relatedness and reciprocal relationship between resource-constraints and malnutrition, and identifies five nutrition-related issues generally faced by the South African population. Firstly, great inequities exist in terms of the nutritional status of different populations in South Africa. A second challenge presents itself in the simultaneous occurrence of obesity and underweight cases in rural South African communities, and even in the same households (Kimani-Murage *et al.* 2010; Vorster 2010). This interesting phenomenon seems unique to the South African context and is referred to as a "double burden of nutritional imbalance" (Schönfeldt, Gibson and Vermeulen 2010 258). Possible explanations relate to specific

cultural practices (Schönfeldt, Gibson and Vermeulen 2010) and urbanisation (Vorster *et al.* 2007). Thirdly, South Africa, as so-called middle-income country (Byrd *et al.* 2008) falls among the low and middle income countries where obesity is on the rise (Popkin, Adair, and Ng 2011; Vorster 2010). Next, hidden hunger, which is manifested in the form of micronutrient deficiencies in individuals who appear to be well fed, presents another challenge (Vorster 2010), and finally, nutrition transition has brought about various health-related risks. Kimani-Murage *et al.* (2010), Bourne, Lambert and Steyn (2002) and Statistics South Africa (2013) note how nutrition transition, in which individuals are adopting Western diets that are high in their fat content, energy dense and low in fiber, is spreading in low and middle-income countries (including South Africa). This may lead to early stunting and adolescent obesity occurring simultaneously in one community (Kruger *et al.* 2007).

Poor diet quality of individuals from poor communities has been attributed to the “low cost of widely available energy-dense but nutrient-poor foods” (Caprio *et al.* 2008, 2213). Poor communities tend to eat less-preferred foods, limit their portion-sizes, skip meals or skip eating altogether for complete days, as strategies to deal with food insecurity (Oldewage-Theron, Dicks and Napier 2006). A South African study by Oldewage-Theron, Dicks and Napier (2006) found that children’s diets were on average 62 per cent lower than the guidelines set by the Food and Agricultural Organisation (FAO). Possible causal factors contributing to the poorer diet quality of lower socio-economic groups include expensive food prices, environment, access to food, level of education, and culture (Caprio *et al.* 2008; Darmon and Drewnowski 2008).

Research on food consumption practices of the South African population is fairly limited, as is generally the case with developing countries (Schönfeldt, Gibson and Vermeulen 2010; United Nations 2010). Thus, in order to address food insecurity, and achieve the targets stipulated in the Millennium Development Goals (United Nations 2012), the ongoing South African studies and interventions related to food and nutrition seem to be quite important. Poor South Africa communities generally consume monotonous diets made up of limited items (Faber, Jogessar and Benadé 2001; Schönfeldt, Gibson and Vermeulen 2010), with an example described by Taylor and Janabhai (2001, 137) as , “A single staple, corn prepared in numerous ways, supplemented by dried beans, negligible amounts of milk and occasionally meat and wild greens”, sometimes also including potatoes and pumpkin. Most of the monthly food budget of households in poor communities in South Africa is spent on maize, poultry and brown bread (Martins 2005). Cereals, sugar, stimulants, whole milk and bread are other foods that are commonly consumed in this country (Labadarios, Steyn and Nel 2007; Steyn, Nel and Casey 2006).

Maize meal porridge makes up the greatest part of the daily diets of individuals living in poor communities (MacIntyre *et al.* 2002; Mkhize,

Napier and Oldewage-Theron 2013; Vorster *et al.* 2007). It has been found that, in resource-constrained communities, 47 per cent of money spent on grains is spent on maize products (Martins 2005). Maize is mostly eaten in the form of stiff porridge, but is also served as soft or crumbly porridge, or mixed with pumpkin (Faber, Jogessar and Benadé 2001; Kimani-Murage *et al.* 2010; Oldewage-Theron, Dicks and Napier 2006). Diets that consist mainly of staple cereals or grains, as described above, are associated with micronutrient deficiencies (St. Clair and Lynch 2010). Brown bread and rice are among the other commonly consumed grains within resource-constrained settings (Kruger, Kruger and MacIntyre 2006; Labadarios, Steyn and Nel 2007; Martins 2005).

In South Africa, poor communities typically consume protein in the form of chicken and soybeans spent on poultry, including the heads and feet of chicken (Martins 2005). Although not as commonly consumed, nearly 80 per cent of the money spent on fish products in resource-constrained settings is spent on tinned fish (Martins 2005). The amount of sugar consumed by individuals as part of their diet is generally very high (Vorster *et al.* 2007). The forms in which sugar is taken in includes white sugar, carbonated drinks and squash (Oldewage-Theron, Dicks and Napier 2006). Cookies, cake and jams are other common sources of sugar (Steyn, Myburgh and Nel 2003; Temple *et al.* 2011). Adolescent and school-going children have been found to buy food high in sugar (including chocolates, soft drinks and candy) from school tuck shops, local vendors and shops close to schools (De Villiers *et al.* 2012; Temple *et al.* 2006). Sugar consumption should be monitored, as high intake is associated with, among other, dental caries and obesity (Steyn, Myburgh and Nel 2003). Individuals from poor communities tend to prefer less salty food, however commonly consumed foods like bread and junk food bought from vendors and spaza shops (informal shops in houses or in the community) are likely to contain large amounts of salt (Bradshaw and Steyn 2001). Stimulants, mainly in the form of tea (ceylon and rooibos), and sometimes in the form of coffee, are consumed by most individuals (Mkhize, Napier and Oldewage-Theron 2013; Oldewage-Theron, Dicks and Napier 2006), with families in poor settings spending around 80 per cent of the money they spend on non-alcoholic beverages and tea (Martins 2005).

Fruit and vegetable consumption is generally poor in these communities (Kruger, Kruger and MacIntyre 2006; MacIntyre *et al.* 2002). Cabbage is eaten most frequently (Oldewage-Theron, Dicks and Napier 2006; Taylor and Jinabhai 2001), and is generally prepared with onion, tomato and oil (Vorster *et al.* 2007). This is, however, not ideal, as there are many alternative vegetables that are richer in vitamin content (Taylor and Jinabhai 2001). Other vegetables eaten include tomatoes, onions, spinach, potatoes, pumpkin, carrots and beetroot (Green, Botha and Schönfeldt 2004; Mkhize, Napier and Oldewage-Theron 2013; Oldewage-Theron, Dicks and Napier 2006). Many individuals from poor communities also eat indigenous, wild-growing green leafy vegetables (Faber, Jogessar and

Benadé 2001; Green, Botha and Schönfeldt 2004), of which approximately 800 to 1000 different species grow in Sub-Saharan Africa (Fanzo and Pronyk 2011). These leafy vegetables have many nutritional benefits and are easily obtainable, however, they are often not utilised to their full potential (Orech *et al.* 2007; Smith and Eyzaguirre 2007). Intake of micronutrients in the form of vitamins and minerals is generally low, and most children do not get sufficient Vitamin A, Calcium, Iron and Zinc supplies as part of their diet (Faber, Jogessar and Benadé 2001; Labadarios, Steyn and Nel 2007).

The WHO (2006) relates approximately two million deaths per year to contaminated water and food. In an attempt to address this problem, the World Health Organisation developed key points to keep in mind when working with and preparing food. These are firstly to keep clean, secondly to separate raw and cooked ingredients, thirdly to cook thoroughly, fourthly to keep food at safe temperatures and lastly to use safe water and raw materials (WHO 2006). The manner in which foods are processed and prepared affects the nutrient-content of the final consumed product (Hotz and Gibson 2007; Severi *et al.* 1998). In poor communities in South Africa, foods are commonly cooked with sunflower oil (Faber, Jogessar and Benadé 2001; MacIntyre *et al.* 2002). Furthermore, the use of chemicals such as paraffin for cooking purposes is common, which may bring about various health risks (Muller *et al.* 2003).

In terms of the frequency of eating, the National Food Consumption Survey (NFCS) (Labadarios, Steyn and Nel 2007) found that most South African children eat breakfast daily, however with around 10 to 20 per cent of children in Gauteng do not get breakfast regularly. Furthermore, it was found that the majority of children eat three meals a day. According to Martins (2005), poor families' annual food budget can be as little as R4040 (the equivalent of around US\$365) for a family of three to four persons. This is lower than the Minimum Living Level budget expected for a family of two people.

Temple and Steyn (2011) note how a healthy diet is unaffordable for most people living in South Africa. Individuals' food consumption behaviour need to be viewed and understood within their context as socio-economic factors, cultural practices and environmental factors influence what individuals eat (Puoane *et al.* 2006). In this regard, Voorend *et al.* (2013) mention availability, price and quality of foods as factors influencing the food choice of adolescents buying foods at school. Meat and fast foods tend to be associated with status, and consequently the intake of these foods increase as income increases (Puoane *et al.* 2006). Children from high socio-economic backgrounds are more likely to have breakfast and to bring lunch to school (Temple *et al.* 2006). And yet, informal vendors sell energy dense fast-foods and snacks at prices that are affordable and often more appealing to poor communities (Feeley *et al.* 2012; Steyn, Labadarios and Nel 2011), resulting in children choosing this option. In general, inflation is

seen as a major risk factor that often promotes the monotonous nature of diets of individuals from lower income groups (Schönfeldt, Gibson and Vermeulen 2010).

4. Health Promotion Role of Local Government

In recent years, the focus of interventions for health promotion has shifted from behavioural change at an individual level to health-oriented behaviour and determinants such as nutrition-related education and healthy diets, physical activity, personal hygiene and collective well being at a community level (Tang, Beaglehole and O'Byrne 2005). Communities are expected to form part of health promotion interventions in order to promote and sustain their own health and collective well-being. Peu (2014) is of the opinion that health promotion interventions should be available and accessible to individuals, families and communities; and furthermore indicates that health promotion can be regarded as a strategy to support community members to practice healthy behaviour within their contexts. Howat *et al.* (2003) emphasise that 'community development' and 'capacity building' are inherent to the definition of health promotion, and requires collaborative working coalitions across a range of different sectors of society, including local communities, families, public and private sector, as well as governmental and non-governmental organisations (Green 2004).

Health promotion and education interventions therefore accentuate the important role of individuals, communities and organisations as action-oriented agents during the formulation of health-promoting practices and policies in order to enhance health and well being. Of particular importance is the focus of interventions on quality of life, development and well being within an identified geographical context (Stokols 1995). An important advantage of delivering health promotion and education interventions at community level is the possibility of positive, informed change with regard to health-promoting behaviour and beliefs (Crosby, Kegler and DiClemente 2009). Interventions are proactive in nature and can equip community members with the necessary knowledge and skills in order to identify available assets to more effectively cope with community-wide health-related challenges.

Publication of the Millennium Development Goals (MDGs) has been one of the most successful global anti-poverty development efforts. According to the Millennium Development Goals Report (United Nations 2013) around 700 million fewer people were living in conditions of extreme poverty and experienced hunger in 2010 than in 1990. Despite this global achievement, 1.2 billion people are still living in extreme poverty and experience hunger in Sub-Saharan Africa. This particular region is the only region where almost half of the population lives on less than US\$1.25 a day and where extreme poverty and hunger rose steadily from 290 million in 1990 to 414 million in 2010. Amongst other strategies, the Millennium

Development Goals promoting effective school-based nutrition, universal primary education and improved access to social support.

In South Africa, local government pledged to put children first by adopting the United Nations Convention on the Rights of the Child (United Nations 1989) and the Bill of Rights of the South African Constitution (Government of the Republic of South Africa 1996). This commitment is especially important during the intermediate school years (Grades 4–6) during which special emphasis on learner's optimal health, by means of school-based health-promotion interventions, will not merely improve their survival, growth and overall health, but also their learning, development and collective well-being (Departments of Health and Basic Education 2012). The WHO Expert Committee on School Health (WHO 1996) argues that school-based health promotion and education interventions will improve community-wide health and well-being, education, social and economic development.

Several South African policies have been put into effect and enforced to address household food insecurity. These policies have led to food fortification, food supplementation and school feeding programs (Netshitenzhe 2007). For example, the South African Integrated School Health Policy (Departments of Health and Basic Education 2012) emphasises the implementation of health promotion and education interventions that will promote health and well being throughout learners' lives. Similarly, the road map document used by the South African education sector, *Schooling 2025 and Action Plan to 2014* (Department of Basic Education 2009) identifies the provision of health-promotion and poverty reduction interventions as prominent national goals. South Africa, as a developing country, has thus pledged to put learners first by focusing on their needs as a high priority.

The Department of Basic Education furthermore aims to enhance education of children in poor communities by providing them with daily meals at school as part of the National School Nutrition Programme (NSNP) (Department of Education 2009). The NSNP is specifically aimed at children who attend schools in extreme poor settings (Department of Basic Education 2011). As part of the program, more than 8 million children are provided with one balanced meal at school per day, thereby contributing to 30 per cent of the children's daily nutritional requirements (Department of Basic Education 2013; Eberlein 2013). Besides the Department of Basic Education providing all participating schools with the necessary cooking equipment and utensils, ingredients, and a monthly honorarium for volunteer food handlers (Department of Education 2009), the NSNP has brought about a culture of vegetable gardens at schools. This in turn provides fresh produce for daily meals, seeds for home vegetable gardens, leftover meals for needy families, and opportunities for practical learning experiences in subjects such as Mathematics, Life Orientation, Natural

Science, and Economic and Management Sciences (Department of Basic Education 2010).

5. The Role of Interdisciplinary Community Coalitions in The Development of School-based Health Promotion and Education Interventions

The past 20 years have seen a variety of collaborative efforts developed among academics, organisations, health and education sectors, as well as communities, aimed at co-constructing innovative interventions in order to improve quality of life, community-wide health, social development and collective well-being in poor communities. Interdisciplinary collaborative community coalitions imply collective actions by individuals and groups with a shared communal vision, where the assets and skills of professionals, the community and other stakeholders are combined (El Ansari 2012). According to Stokols *et al.* (2003, S24), "...interdisciplinary collaboration is a process by which researchers work jointly, but from each of their respective disciplinary perspectives, to address a common problem". Such interdisciplinary collaborative community coalitions that aim to facilitate meaningful health promotion and education interventions require the right amount of discipline specific knowledge as well as effective community coalitions, which can deepen collective knowledge and the capacity to take action (Sutton and Kemp 2006).

As such, interdisciplinary community coalitions have been established worldwide to mobilise available resources and to coordinate intervention-related activities towards the improvement of public health (Chan, Lam and Cheng 2009). In this manner, interdisciplinary community coalitions can be regarded as a distinguished developmental strategy for enhancing community-wide health and well-being (Butterfoss 2004; Watson-Thompson, Fawcett and Schultz 2008) and have been initiated to attend to a variety of health-related challenges, such as alcohol and drug abuse, HIV and AIDS, diabetes, asthma, food insecurity and nutrition over the past thirty years (Butterfoss and Kegler 2012). Interdisciplinary community coalitions also create niches of opportunity for community members and entities to collaborate, while building community capacity and maintaining local autonomy (Wolf 2001).

We support the idea of Zakocs and Edwards (2006) who contend that interdisciplinary community coalitions resonate with the value of democracy, by encouraging community members to construct their own local solutions to needs and challenges by incorporating local assets and resources, as well as by means of collaborative partnerships among multiple stakeholders, to jointly focus on and positively affect the facilitation of sustainable community-wide change and health-related well-being (Wolf 2001; Granner and Sharpe 2004). We believe that interdisciplinary community coalitions typically respond to local needs and

challenges through a social ecological lens, while incorporating multilayered intervention strategies (Zakocs and Edwards 2006). Roussos and Fawcett (2000) are of the opinion that interdisciplinary community coalitions focus on improving community-level health and well-being by creating environmental changes from an ecological approach (Stokols 1996) in the various sectors in which health-related behaviour occur.

We furthermore regard interdisciplinary community coalitions as dynamic in nature, with the potential of facilitating basic empowerment on different ecological levels, and encouraging diverse community participation, ownership and a distinctive focus on reaching the broad community (Kadushin *et al.* 2005; Butterfoss 2004; Wandersman and Florin 2003). Another aspect of interdisciplinary community coalitions is the focus on comprehensive engagement through participation, planning and implementation in order to generate sustainable opportunities that will foster and develop community-wide improvement of health-related behaviour, and collective well-being. Butterfoss (2004) pointed out that community members, within the framework of interdisciplinary community coalitions, have the ability to identify local needs and challenges, mobilise available assets and address health-related issues, as well as the necessary skills to cultivate and transfer knowledge and systems that might have an impact on community- and individual-level changes. Members from poor communities therefore possess the necessary skills and assets to address health-related challenges and support quality of life, community-wide health, social development and collective well-being within interdisciplinary community coalitions (Hughes 2008).

6. The Potential Role of Schools in Health Promotion and Education Interventions

Schools have been identified as excellent environments and unique resources to promote quality of life, positive behaviour changes amongst individuals, as well as community-wide health and collective well being through the implementation of community specific health promotion and education interventions (Roseman, Riddell and Haynes 2011). No other institution has as much continued contact with school-aged learners (Story, Kaphingst and French 2006) during their first two decades of life. Therefore, schools provide numerous opportunities for direct health promotion and education interventions (Power and Blom-Hoffman 2004).

In addition, schools are the most common means through which society prepares learners for their future (Oseji and Okolo 2011). Schools have the potential for accessing almost an entire population of learners, including minority and vulnerable groups. Schools provide an ideal opportunity for health promotion and education interventions to address the various health and socio-economic challenges that may affect South African learners, and have been identified as a central source for successful health promotion and education interventions (Departments of Health and Basic Education 2012;

Power and Blom-Hoffman 2004). Steyn *et al.* (2004) point out that schools can provide a stable environment for health promotion interventions, as they have the advantage of influencing health-related behaviour that may become established patterns during adulthood. Learners also represent a large population that is accessible over a prolonged period of time, in a setting where learning and education are the norm. Positive educational outcomes linked to good health and collective well being in learners include improved classroom participation, school attendance and positive learner attitudes (Department of Health 2007).

In addition, schools are also an important link between parents and communities. Evidence indicates that school-based health promotion and education interventions that involve parents or families and community members might in turn positively influence the wider community (Power and Blom-Hoffman 2004). Through school-going learners, the health system could potentially reach far beyond the walls of health institutions and facilities (Departments of Health and Basic Education 2012), while the involvement of parents, families and local community members can act as reinforcement and support of health promotion and education interventions implemented by school. According to Power *et al.* (2004) such involvement will allow schools to explore the assets of learners, parents and the community at individual, community and institutional level, that may create and sustain community-wide health and collective well being.

7. Research Methodology

In this section we provide an overview of the paradigmatic approaches we followed. We discuss the research methodology that informed our study, and explain the methods employed for the purpose of data collection, documentation and analysis.

7.1. Paradigmatic Approaches

For the purpose of our study, we adopted an interpretivist meta-theoretical paradigm. Interpretivism emphasises the meaning that people attach to their lived experiences and the “uniqueness of a particular situation” (Kelliher 2005, 123). As interpretivist researchers we aim to provide the reader with information and insight into the manner in which the developmental process and characteristics of the Win-LIFE intervention may inform existing knowledge on health promotion and education interventions, and the potential role that schools can play in supporting the health and well being of vulnerable communities. We also highlight the manner in which interdisciplinary collaborative community coalitions, situated within a framework of PRA, informed and enriched the content of the Win-LIFE intervention. Interpretivism reflects our belief that people or communities socially construct meaning through interaction with the world around them. We regard the participants of this study, both the parents and teachers of the poor community where we undertook our study, as well as participants

from professional sectors, as experts of their own lives and co-constructors of knowledge. In this manner, knowledge was co-constructed through a process of prolonged engagement with participants (Terre Blanche and Durrheim 2002), during which we used various methods to collect data in an interactive manner, with the aim of interpreting the meaning underlying the participants' perceptions, experiences and opinions (Denzin and Lincoln 2000).

The use of PRA as methodological paradigm provided a staple for an in-depth understanding of health-related aspects and barriers related to the participating community. By following a PRA-approach, we as researchers were able to collaborate with the participants in planning, developing and implementing the Win-LIFE interventions (Farquhar *et al.* 2006). Furthermore, we could adopt an insider (emic) perspective, which entails an in-depth enquiry that allowed us to explore a social phenomenon in a naturally occurring environment (Loots 2011; McMillan and Schumacher 2014).

We based our approach on two central principles underpinning PRA, namely the generation of data by relying on local knowledge, and acknowledgement of the critical role of the participants during the entire research process (Von Maltzahn and Van Der Riet 2006). Boothroyd, Fawcett and Foster-Fishman (2004) together with Watson-Thompson (2007) similarly emphasise the importance actively involving community members when planning, developing and implementing interventions for the purpose of research and/or development. In this regard, a PRA-approach guided us in viewing community members as the experts, based on their local knowledge of their context, and their experiences of specific health-related challenges in the community (Watson-Thompson 2007).

7.2. Research Site and Sampling Procedures

The selected community is characterised by poverty, high levels of unemployment, household food insecurity and infrastructural challenges related to electric power, sanitation and running water. The community consists of a population of 22434 people (5812.57 people per km²) and 7069 households (1831.55 per km²) (Statistics South Africa 2013). The largest racial group residing in the community is black Africans (97.19 per cent), with a preference to speak isiNdebele (29.61 per cent), isiZulu (27.94 per cent) and SePedi (13.22 Per cent). Our rationale for conveniently selecting this specific community and the three schools situated in the community relates to an easy accessibility to the research site, and to existing positive relationships between the national department of education and teachers at the schools, prior to our study (Fritz and Smit 2008; Lune and Berg 2012). In addition, an employee of the department of education voiced the need for support and intervention in the particular community, based on her involvement at and prior knowledge of the school. We therefore, relied on convenient sampling in selecting the three primary schools where we, conducted the study. School A had 1314

registered learners at the time of our study, School B 1053 registered learners, and School C 1498.

As interpretivist researchers, we strove to interpret the experiences of people (Denzin and Lincoln 2005). We relied on purposive sampling to select the groups of participants (Grade 4–6 teachers, parents, university researchers from five departments at the University of Pretoria, researchers from the Agricultural Research Council and representatives within the National School Nutrition Program at the Department of Basic Education). As such, we purposefully selected specific participants in order to learn and maximise our understanding of the phenomenon we set out to explore (Onwuegbuzie and Leech 2007; Creswell 2012). Depending on the manner in which the developmental process and characteristics of the Win-LIFE intervention may inform existing knowledge on health promotion and education interventions, the role schools may potentially fulfill in supporting health and well-being, and the community coalitions and interdisciplinary collaborative partnerships within PRA-research reflects the content of the Win-LIFE intervention we developed.

More specifically, we employed criterion sampling (Patton 1990; 1994; 2001) when selecting the teacher participants. Our objective was to study and interact with teacher participants that met predetermined selection criteria. Next, parent participants were selected by means of snowball sampling (Patton 1990; 1994; 2001) in our attempt to involve information-rich informants. The school principals of the three selected primary schools initially assisted us in identifying parents we could involve, with the snowball effect evolving as we involved information-rich cases (parent participants) (Onwuegbuzie and Leech 2007). When selecting which university researchers and representatives from the Agricultural Research Council (ARC) and the Department of Basic Education to involve, we relied on maximum variation sampling (Patton 1990; 1994; 2001), thereby, sampling participants who differ in terms of certain characteristics (e.g., different departments within the university and government, different age groups, different genders) (Creswell 2012) but who allowed us to obtain multiple perspectives from individuals (Onwuegbuzie and Leech 2007).

7.3. Data Generation, Documentation and Analysis

We used multiple methods of data generation and documentation (Patton 2002; Terre Blanche and Durrheim 2002) in order to enhance the depth of our understanding, and also to add rigor to our study. Our choice of data generation and documentation strategies were influenced by the PRA methodology we followed. In line with a PRA-approach, we selected methods that are creative, flexible and visual by nature (Chambers 2004). As background to implementing these methods, we first completed policy and document reviews (Fraquhar, Parker, Schulz and Israel 2006). We analysed the following South African policies and government documents, namely, the National School Nutrition Programme (NSNP 2004), the Care and Support for Teaching and Learning Programme (2008), the National

Strategy on Screening, Identification, Assessment and Support (2008), the National Action Plan (2014), Towards the Realisation of Schooling 2025 document (2009), the Curriculum and Assessment Policy Statement (2012), and the Integrated School Health Policy (2012). In addition, we analysed the following international documents: the Health Promoting Schools Initiative (1997), and documentation on the MDGs, (United Nations 2013).

Most of the South African policies we reviewed propagate the provision of a healthy, enabling inclusive school environment through implementation of health promotion and education interventions. The Integrated School Health Policy (Departments of Health and Basic Education 2012), for example, indicates that health promotion interventions should provide a practical health education, together with school-based health and nutrition-related support to learners. Closely related, the Health Promotion Schools Program (WHO 1996) strives to increase international, national and local capacity for the development of health promoting schools, which include the provision of school-based health education, together with the improvement of community-wide health and implementation of health promotion practices. Such interventions can potentially contribute to the MDGs being met (United Nations 2013).

After analysing the said policies and related documents, we facilitated three PRA-based workshops with parents of the school (one in each school), and six workshops with teachers (two in each school). These workshops allowed us to observe the interaction between participants, while accessing their opinions, perceptions and experiences. Workshop activities involved participants working in small groups, discussing certain questions (Photograph 3) and then providing feedback to the larger groups they participated in (Photograph 4). As such, participants expressed their perceptions both in written and verbal formats. Questions that guided small group discussions centred on food and nutrition-related behaviour patterns and perceived preferences of the community. During the workshops, we could explore any contradictions and uncertainties that occurred (Leach 2003).

In addition to PRA-workshops, we facilitated a focus group discussion in order to explore the opinions and perceptions of academics in the field, with the aim of generating ideas for developing the Win-LIFE intervention. University researchers and post-graduate students from different faculties within the University of Pretoria participated in the focus group discussion, in November 2013. Questions that guided the discussion were designed to invite different perceptions in the defined area of suitable content for the Win-LIFE intervention (Krueger 1994, 6). Following on the focus group, we used semi-structured interviews with representatives of the ARC and Department of Basic Education, in order to understand their views against the background of their lived experiences (Suzuki *et al.* 2007 308). Interviews allowed us as outsiders to gain insider knowledge (Patton 2002).



Photograph 3. PRA Workshop Participants Hold FGD

For data documentation, we relied on audio-recordings of discussions, photographs, posters compiled during PRA-sessions, field notes and reflective journals. Through the collection of visual data we attempted to provide a holistic and descriptive image of the research setting, participants and the activities they were involved in (De Lange, Mitchel and Stuart 2008). Observation, as data generation strategy, is often employed in interpretivist studies, as it allows the researcher to capture the natural setting of the social phenomenon under study, in our case by means of photographs and field notes (Terre Blanche and Kelly 2002). Our chosen method of observation was observation-as-context-of-interaction (Angrosino and Mays de Pérez 2000). In our reflective journals, we documented our experiences and thoughts, in an attempt to identify possible assumptions, make sense of the data and record any aspect that might affect the data, thereby enhancing interpersonal reflexivity (Casey 2007; Zuber-Skerritt and Fletcher 2007; McMillan and Schumacher 2014).

Following data generation we completed inductive thematic analysis, a method often associated with interpretivist research (Braun and Clarke 2006; Creswell 2012). During the process of inductive thematic analysis we synthesised the data and attempted to make meaning of the data. We started by engaging with the large amount of data that had been generated, and subsequently ended with three main themes, and related sub-themes (McMillan and Schumacher 2014). Inductive thematic analysis and interpretation acknowledges the co-construction of knowledge and meaning making that we followed, involving both researchers and participants, in our attempt to create an understanding of the participants' meaning making

experiences. After our initial analysis, we conducted member checking by presenting our preliminary findings to the participants (teachers and parents) in order to provide them with the opportunity to confirm and refine the identified themes, and elaborate or clarify where necessary (Patton 2002; Braun and Clarke 2006; Loots 2011; Creswell 2012; McMillan and Schumacher 2014).

Following on this phase of the study, we developed the Win-LIFE intervention, based on the data that had been generated and the themes we identified. As part of the process, we developed a teacher's manual and a learner's manual for each of the subject areas that the intervention would form part of, namely Life Sciences (focusing on nutrition education) and Natural Sciences (focusing on environmental education). As a final step, before finalising the manuals and implementing the Win-LIFE intervention, we facilitated another PRA-workshop, where participating teachers discussed the intervention and draft manuals in small groups, providing input in terms of suggested changes, additions or omissions. This session provided for another round of member checking, thereby, supporting the rigour of the study.

7.4. Ethics and Rigor of the Study

Throughout the research process, we followed the guidelines for conducting ethical research. We obtained informed consent from all the participants prior to the study and followed stipulations related to confidentiality, anonymity, and the right of participants to withdraw from the project should they wish to do so. Participants were not deceived in any manner and we discussed the research process and purpose with them throughout the study. We took the necessary precautions not to expose the participants to any form of harm, and highlighted the potential value that their participation could imply (Creswell 2012; Patton 2002).

In support of a rigorous study and in seeking trustworthy findings we implemented various strategies in order to meet the quality criteria of credibility, confirmability, transferability, dependability and authenticity (Lincoln and Guba 1985; Patton 2002). In addition to spending a prolonged period in the field, we remained aware of our potential bias and the differences between the participants and us. When uncertain about something, we requested clarity from the participants. We regularly reflected on the study and our experiences in the research field, and engaged in scholarly discussions on our thinking. We involved the participants in member checking activities throughout the study. In disseminating the findings and documenting the study, we focus on detailed descriptions and explanations, in an attempt to provide an authentic description of our experiences in the field (Lincoln and Guba 1985).

8. Discussion of Results

In this section we discuss the results of the study.

8.1. Theme 1: Current food consumption practices in the participating community

Teacher participants focused on typical food consumption practices of fellow community members. They viewed the participating community as resource-constrained and emphasised that unemployment was at the order of the day, resulting in hunger and affecting decisions about food patterns and behaviour. In addition to these challenges, teachers identified lack of education and high numbers of child-headed households as social challenges in the community, having an effect on community members' food-related decisions, which in turn would impact on health and well-being.

8.1.1. Sub-Theme 1.1: Daily Eating Patterns of the Community

During the PRA-discussions, participants agreed that porridge, black tea, bread and leftover food were the most commonly consumed food items for breakfast. Parent participants explained that "During breakfast at home, we drink black tea, with the leftovers of the previous day in the morning. We also eat porridge that was cooked yesterday..." (PRA parent workshop, School A). Teachers agreed, stating that "20 per cent of parents eat soft porridge and cereal. Eighty per cent of parents eat tea and bread, with or without spread... 5 per cent of learners drink tea with stiff pap, 20 per cent of learners eat fat, cakes/buns/cakes, while 60 per cent of learners drink tea and bread..." (PRA teacher workshop, School B). It became clear that many learners did not eat breakfast at all at home, and that there were only a privileged few who would enjoy cereal and other items for breakfast. According to one of the parent participants, "... some kids don't eat anything at all early in the morning until they arrive at school..." (PRA parent workshop, School A).

For lunch, participants reported that the majority of the learners would eat lunch at school, which was made up mainly of maize or beans with vegetables, and a fruit once a week. Participants agreed that "Learners eat at school, they are provided with lunch..." (PRA parent workshop, School B) and "during lunch, here at school we give bread, samp and beans..." (PRA teacher workshop, School A). Learners were occasionally provided with "pap and brown bean soup...pap and cabbage or samp with soup...and once a week they are provided with fruit..." (PRA teacher workshop, School B). If lunch was taken at home, it seemingly consisted mainly of carbohydrates (in the form of maize or bread), vegetables and, at times, tinned fish. According to the participants, "some community members eat tinned fish, maybe with rice, pap, bread..." (PRA teacher workshop, School A) while others would eat "pap, any available radish, whether it's cabbage, onion and tomato soup etc..." (PRA parent workshop, School B). Selected

learners from more fortunate families reportedly brought their own lunchboxes to school, made up of more balanced meals. However, teacher participants agreed that “less than 2 per cent of learners bring their own lunch boxes...” (PRA teacher workshop, School B).

For dinner, participants explained that carbohydrates (mainly in the form of maize), vegetables, and, at times, protein (in the form of chicken, fish or Mopani worms), made up the dinner plates of most community members. One of the teachers summarised this trend in the following way: “...during dinner time, community members normally cook spinach, in our township language we call it marogo, with porridge, sometimes with tinned fish mixed with tomato and onion...” (PRA teacher workshop, School A). A parent confirmed this trend and further elaborated, saying that she prefers “pap with some cabbage or bean soup or chicken heads and chicken feet or mopani worms...” (PRA parent workshop, School A).

8.1.2 Sub-Theme 1.2: Food Resources Available in the Community

Participants discussed sources of food in the community and means for community members to obtain food. Individuals in the community seemingly obtained food in various ways, namely in the form of donations and from organisations, from local shops and vendors, from the dumping site situated in the community, and/or from local community food gardens. Teachers were of the opinion that learners often benefited from the national feeding scheme at the school, stating that, “at school we have a feeding scheme, where we feed all the learners on a daily basis...” (PRA teacher workshop, School A). Local institutions, non-governmental organisations, shops and churches reportedly also donated food parcels to community members. Even the teachers supported the community, as captured by one of the teacher participants: “as teachers, we buy food and we do give learners food from our homes...” (PRA teacher workshop, School A). Some of the parents emphasised that they would also “... *get food from the leftovers from the employers...*” (PRA parent workshop, School A).

When buying food, participants reportedly primarily bought from local shops and supermarkets in the area. According to the parent participants, they would “usually buy food from spaza shops around the township. We also have shops like Shoprite, Spar, Cash and Carry...and also the Indian shops...” (PRA parent workshop, School A). During the discussions, it became clear that community members’ choices of shops were primarily determined by the prices of the store and the affordability of items. Participants revealed that “Cash and Carry... So, it means everything is cheap there. Everyone is running to that supermarket ...” (PRA parent workshop, School A), “...where they buy when there are specials...” (PRA parent workshop, School A). Local vendors were identified as yet another source of food products for the community, in addition to local shops and supermarkets. Another means of obtaining food, specifically among very needy members of the community, was located at the local dumping site. Here, “poor, unemployed community members get food from the dumping

site...” (PRA teacher workshop, School B), reportedly collecting leftover food and expired foods. In addition, teachers mentioned that for other community members, “some eat from the garbage cans ...” (PRA teacher workshop, School C).

Lastly, participants identified community-based food gardens as a potential source for obtaining food. According to the participants, “older people who started food gardening where they plant spinach, maize, cabbage and other vegetables, also support poor, unemployed community members ...” (PRA teacher workshop, School A). Parents similarly referred to other community members as “growing their own food in their backyards...” (PRA parent workshop, School B), where they “... plant vegetables like spinach, tomatoes, onions, carrots, cabbage and beetroot...” (PRA parent workshop, School C). Such community-based food gardens appeared to support the community and bring relief to some of those living in poverty.

When prompted further in terms of food production practices in the community, participants indicated that they preferred to produce their own vegetables, based on vegetables being affordable and healthy: “...we produce vegetables like potato, tomato, spinach, cabbage and spring onion...” (PRA parent workshop, School B). They mentioned that they followed specific food production methods when planting seeds in order to produce vegetables, and highlighted the importance of efficient soil preparation and enough water. The parents explained the process: “...turn the soil, then sprinkle fertiliser on the soil, then you water the garden, plant the seedlings and after 7 days the seedlings are visible...” (PRA parent workshop, School B), and: “use chicken dung or sawdust to prepare the soil...then you plant the cabbage or potatoes...you water them and after two months you can eat them...” (PRA parent workshop, School A). Besides vegetables, some community members reportedly engaged in small-scale chicken farming.

8.1.3. Sub-Theme 1.3: Food Purchase Practices in the Community

During the PRA-workshops parent participants indicated that they preferred to buy food at specific shops or informal traders. Participants mentioned several examples of food types they preferred to buy, relating their reasons for specific choices to affordability, quality and health. Participants indicated a variety of places as preferred places to buy food, saying “...we buy from the vendors market...” (PRA parent workshop, School B), and the “farmers market and super market” (PRA parent workshop, School B). Several participants were very specific and indicated that they preferred to buy at shops such as “...Shoprite, tuck shops, Varuku, Sipho Thokoza and from the women who sell at the taxi rank” (PRA parent workshop, School A).

Most of the participants agreed that community members preferred to buy a variety of products yet they also mentioned specific food types that were often purchased. As consumers, participants reportedly preferred to buy

“...mielie meal, rice, mixed portion chicken, vegetables, cooking oil, spices, soups, bread, chicken feet and gizzards, eggs, polony, little bit of fruit and coca cola...” (PRA teacher workshop, School B), as well as “...tin fish, KOO baked beans, rice, fish oil, sometimes we buy flour to make ‘vetkoek’ or dumplings” (PRA workshop, School C, P2, Field notes) and others mentioned “...tea, coffee, rooibos, salt and beans...” (PRA parent workshop, School C). When asked about the reasons for these preferences, participants firstly referred to affordability, clearly stating that, “we buy food that we can afford” (PRA teacher workshop, School C). They further elaborated that they specifically preferred “the no name brand products, because they are cheap and affordable” (PRA parent workshop, School C). Secondly, participants considered their own health when they bought food products, “because they are good for the body” (PRA parent workshop, School B), stating that “...they are healthy and it builds your body” (PRA parent workshop, School A). Thirdly, participants considered quality when deciding what to buy. They however emphasised that only selected community members could afford “good quality” food (PRA parent workshop, School C).

8.1.4. Sub-Theme 1.4: Food Preparation Practices of the Community

During the PRA-workshop discussions parent participants elaborated on preferred food preparation practices, as evident in the community. Participants mentioned that women in the community would prepare food in one of several ways, highlighting the preference for either boiling or deep-frying food. Participants indicated that “most of the time we deep-fry our food” (PRA parent workshop, School B), “boil the vegetables and put salt in” (PRA parent workshop, School C), or “boil the chicken and then we put spice on it and then we fry it” (PRA parent workshop, School C, P4).

Participants agreed that they themselves would prepare the households’ food, at times with the assistance of their daughters or mothers. When asked about preferred ways of food preparation, participants indicated a wide variety of food preparation practices, stating that, “in our community the people use gas, paraffin stoves, wood fire and electric stoves” (PRA parent workshop, School C). The majority of the participants, however, made use of electricity and stoves to prepare food at home, whilst some preferred more traditional food preparation methods. Participants mentioned that some of them would “cook on electric stove” (PRA parent workshop, School B) or “use a microwave oven” (PRA parent workshop, School A). Merely a few indicated the preference to “... cook on the wood fire outside” (PRA parent workshop, School B).

8.2. Theme 2: Community’s Needs in Terms of Nutrition-related Knowledge and Skills

Participants referred to various categories of nutrition-related needs, in terms of the knowledge and skills required by the community.

8.2.1. Sub-Theme 2.1: Need for Guidance and Skills on Food Production

Participants indicated that community members needed guidance with regard to food production, and highlighted the possibility and potential value of gaining entrepreneurial and empowering skills, more specifically referring to possible financial gain for community members should they apply such knowledge and skills. To this end, a teacher participant indicated the view that the community required “empowerment to produce their own food and that will give them some source of income” (PRA teacher workshop, School A.). In addition, both parents and teachers displayed the need for knowledge and skills for independent vegetable garden production. Participants agreed that their community members need workshops and training on food gardening (PRA teacher workshop, School B).

Closely related, a need was voiced for information and guidance on ideal planting conditions and different soil types. One of the parent participants mentioned that “we need to identify the soil types” (PRA parent workshop, School A), and later added that parents needed to learn more about “the most conducive environment for plants to grow in” (PRA parent workshop, School A). Further related, participants mentioned the need to be informed about crop rotation and seasonal plants. The use of fertilisers and pesticides, together with the use of irrigation, were also mentioned: “we also want to learn more about the fertilisers for the garden, how to lay out a garden, pesticides and also accessibility of water” (PRA parent workshop, School A). The participants, furthermore, identified knowledge on herbs as potentially beneficial to community members when preparing food. A few participants mentioned that community members could benefit from knowledge and skills related to livestock farming, saying that “they must be more involved in farming chickens, eggs and milk” (PRA teacher workshop, School C).

When asked about possible reasons for the community not to pursue the possibility of vegetable gardening, participants identified a shortage of land, resources and equipment, as well as lack of knowledge on available resources, as contributing factors. Participants suggested that “Jojo tanks will be needed, also equipment such as fork spade” (PRA teacher workshop, School A), and voiced the need for community members to be “... provided with seeds” (PRA teacher workshop, School B). As confirmation, another teacher propagated that community members “must be given starter packs, for example they should provide people with seeds and planting utensils” (PRA teacher workshop, School B). Other participants indicated that community members needed to be taught “how to make and use simple gardening equipment” (PRA teacher workshop, School C). Despite these needs that the teachers highlighted, they also emphasised that community members had to make use of existing land, resources and projects at their disposal, indicating that the “community must learn to make

use of whatever they have at their disposal instead of wasting it” (PRA teacher workshop, School B).

8.2.2.. Sub-Theme 2.2: Need for Guidance and Skills on Healthy Food Choices

When prompted about the food choices typically made within the community, participants focused on the importance of knowledge related to a balanced diet, and avoidance instant food (so-called “junk food”). A teacher stated: “First of all the community needs to learn more about a balanced diet” (PRA teacher workshop, School A) and “get training about healthy food choices” (PRA teacher workshop, School B). More specifically, participants were of the opinion that community members required knowledge on the value of “various vitamins, proteins, fats and carbohydrates” (PRA teacher workshop, School A).

Furthermore, participants emphasised that community members needed to be informed about the importance of drinking enough water and indicated that the community should be “encouraged to drink lots of water” (PRA teacher workshop, School A). Participants identified suitable alternatives for the choices often made by community members. One of the teachers said that “they need to know that they should choose white meat instead of red meat, brown sugar instead of white, tea should be Rooibos or green tea instead of coffee. Black tea also, and then they need to drink water instead of fizzy drink, drink milk or juice, and they must also use olive oil instead of sunflower oil” (PRA teacher workshop, School C).

In addition, participants indicated the need for information on “how patients can be helped to eat more healthy food?” (PRA teacher workshop, School A), explaining that they “would like to know more about what type of food that we can eat to prevent diseases like diabetes, high blood, cancer and heart diseases” (PRA parents workshop, School C). One of the participants indicated the specific need to be informed on “what to eat to prevent disabilities or stillborn children” (PRA teacher workshop, School C). Closely aligned, teacher participants held the view that community members required information on “what expectant mothers should eat” (PRA teacher workshop, School B), and “which food can help your digestive system?” (PRA teacher workshop, School B). Participants also emphasised the need for knowledge on food processing and storage skills. Teachers namely wanted community members to learn “how long food can be stored in the fridge?” (PRA teacher workshop, School B) and “how to process food?” (PRA teacher workshop, School B), in order for them to be able to make healthy choices.

8.2.3. Sub-Theme 2.3: Need for Guidance and Skills on Food Preparation Practices

During the PRA-workshop discussions participants expressed the need for community members to be trained in food preparation, stating, “when it comes to food preparation they also need somebody who can teach them

how to prepare food in a healthy way...” (PRA teacher workshop, School C). Participants noted that community members tended to be negligent of food labels, more specifically the information on expiry dates and food additives. Teacher participants were of the opinion that this area of food preparation needed to be addressed “whenever they buy or whenever they get the food we need to check on expiry date...we must also check on the preservatives...colourants are very much dangerous...” (PRA teacher workshop, School A). According to the teacher participants, community members also required guidance on hygienic practices during food preparation, explaining that “they need to know that you have to rinse the food before use” (PRA teacher workshop, School A). One participant explicitly said that community members required “training about hygiene and how to handle food” (PRA teacher workshop, School B).

Participants noted cooking methods as another important area for training, and indicated that a “variation of cooking methods are important. Community members must not just only boil, or only fry” (PRA teacher workshop, School A). The participant elaborated, stating the importance of encouraging community members to make use of “steaming, grilling and baking” (PRA teacher workshop, School A, P10). Participants referred to the potential value of workshops in support of community members’ understanding of the preparation of healthy, balanced meals, as well as preserving foods. According to the teacher participants, “at the workshop the food pyramid should be drawn in order to indicate to the people attending so that they can understand how to group the food” (PRA teacher workshop, School B). In addition, participants identified food storage and preservation guidelines as area where the community could gain from knowledge and skills. A participant said that “they also need guidance on how to preserve food so that they don’t have to go to the shops always to buy” (PRA teacher workshop, School B).

8.3. Theme 3: Suggested Content of the Win-LIFE Intervention

During the focus group discussions, semi-structured interviews and PRA workshops, participants agreed that the developers should keep specific guidelines in mind while developing the health promotion and education intervention and furthermore focused on subject-specific content to be included in the intervention.

8.3.1.. Sub-Theme 3.1: Underlying Guidelines for the Intervention

Participants from the University of Pretoria, as well as the ARC agreed that the Win-LIFE intervention should combine basic information with practical activities. One participant suggested “a type of intervention where individuals or postgraduate students will interact with community members, specifically learners and parents. For that I think we need to develop a manual or guidelines and practical activities that will be implemented in the community” (Focus group discussion, university researcher). Another participant agreed, saying that, “the intervention must

be a very accessible document with lots of practical examples” (Focus group discussion, university researcher).

According to the participants the Win-LIFE intervention, targeted at Grade 4 to 6 learners and their families needed to require of the learners to “... learn basic concepts like, for example a healthy diet. You can lead them through the worksheets ... so through the program, eventually they will see where their diet can be adjusted in their circumstances” (Focus group discussion, university researcher). As such, university researchers seemingly agreed that the overall aim should be to enhance learner’s basic understanding and knowledge in terms of quality of life, community-wide health and well being. One of the participants stated that the goal had to focus on “supporting them to become ‘nutritionally and environmentally literate’ community members. The educator’s guide and learner’s workbook should be resource books for educators, learners and their families, and should include health, food and environment-related information, together with CAPS compliant classroom activities and worksheets” (Focus group discussion, university researcher). Besides identifying specific topics to include in the Win-LIFE intervention, participants agreed that the developed intervention should be incorporated into the Life Skills and Natural Sciences curricula.

8.3.2. Sub-theme 3.2: Subject-Specific Content to be Included in the Win-LIFE Intervention

After identifying potential aspects that could form part of an enriched school curriculum across learning areas, participants agreed that the Life Skills and Natural Sciences curricula were most suitable for enrichment via the Win-LIFE intervention. For the purpose of this chapter, we only focus on the identified topics that apply to Life Skills and Natural Sciences, and do not include references to all potential areas of enrichment.

Participants firstly indicated the need for learners to be taught on a balanced diet, consisting of various food groups. In this regard, teacher participants stated that “Nutrition is very important, a balanced diet, they must know it” (PRA teacher workshop, School A) and that learners should furthermore learn “about different types of food groups” (PRA teacher workshop, School C), in terms of the food pyramid. In this regard, participants shared their view that healthy, balanced eating habits could be included in Natural Sciences, dealing with “aspects like the food pyramid, balanced diet, healthy living, hygiene and useful plants” (PRA teacher workshop, School B). With regard to the indicated topics of personal care, more specifically hygiene and physical activity, participants were of the opinion that these aspects could be included in an enriched Life Skills curriculum. Participants also felt that assertiveness was essential in order to promote healthy lifestyles amongst the learners, as captured in the following excerpt: “we feel that learners should also be taught how to be assertive...they must know how to say no” (PRA teacher workshop, School A).

Participants indicated that subsistence farming-related issues should be covered in the subjects Natural Sciences and Technology, emphasising that “learners must have agricultural knowledge” (PRA teacher workshop, School C). They highlighted the areas of livestock farming, saying that “learners need to understand how to breed chickens” (PRA teacher workshop, School C); and vegetable gardening skills, focusing on irrigation, pest-control, different soil types and crop rotation. According to the teacher participants, learners had to “... learn about the growing of plants, also they must know the parts that are eaten...also soil, they must know which soil is required for a particular crop...” (PRA teacher workshop, School A). Participants also agreed that attention had to be given to season-related issues regarding the production and preservation of foods in both learning areas, referring to some examples: “the enriched curriculum should focus on food processing. We can process food by drying them, we can process food by pickling, freezing them and canning them for the future” (PRA teacher workshop, School C). In addition, aspects such as food preparation, storage and preservation were mentioned as important to include in an enriched curriculum, or health promotion intervention. Similarly, information on the use of equipment for farming purposes was highlighted as important, with participants believing that “learners should learn about equipment such as tractors, generators and spray irrigation” (PRA teacher workshop, School A).

9. Discussion

In our study an interdisciplinary school-based health promotion and education intervention was collaboratively developed by research partners, based on the need to support household food insecurity, malnutrition, hunger and hidden hunger at grass roots level in South Africa. This initiative aligns with interdisciplinary collaborative partnerships in communities, where academics from different disciplines, health services and public/private agencies engage with one another in order to improve community-wide health and collective well being. For such initiatives, Stakeholders invest their ideas, experiences and skills to collectively address health-related challenges through joint decision-making and action (El Ansari, Oskrochi and Phillips 2009).

In our study, the high unemployment rate and decreasing household income of the participating community, made it imperative to plan and implement some kind of support to community members of the selected poor community. This drive correlates with Faber and Wenhold’s (2007) ideas, viewing support to poor South African communities aimed at empowering individuals and a move towards community members taking the lead in addressing the challenges of malnutrition and household food insecurity. To this end, interdisciplinary community coalitions have been established worldwide, in order to mobilise available resources and to coordinate intervention-related activities towards the improvement of public health

(Chan, Lam and Cheng 2009). Interdisciplinary community coalitions are namely regarded as distinguished developmental strategy for enhancing community-wide health and well-being (Butterfoss 2004; Watson-Thompson, Fawcett and Schultz 2008) and have been initiated to attend to a variety of health-related challenges over the past thirty years (Butterfoss and Kegler 2012). The need to provide more interdisciplinary services is continually recognised as major objective within the public health sector (Gannon-Leary, Baines and Wilson 2006; El Ansari and Phillips 2001; El Ansari 2012). In this way, interdisciplinary collaborative community coalitions are increasingly being views as a norm for development within the field of public and community-wide health promotion, health education and disease prevention (Erwin *et al.* 2004; El Ansari 2005; El Ansari, Oskrochi and Phillips 2009).

Our focus on daily food consumption practices in a poor community revealed that community members' diets consist of a limited variety of foods as a result of poverty. Various studies have shown that dietary intake will follow a socioeconomic pattern, with families and children from lower socioeconomic status groups having less than optimal dietary intakes (Darmon and Drewnowski 2008; Kruger, Kruger and MacIntyre 2006; Larson and Story 2009; MacFarlane *et al.* 2007). In general, communities from lower socio-economic groups tend to follow diets that primarily contain refined grains, starchy vegetables, added fats, sweets and fatty meats (Darmon and Drewnowski 2008). Members of the participating community in our study appeared to follow a diet similar to the one described. Such a diet can best be described as repetitive and consisting of little variety (Schönfeldt, Gibson, and Vermeulen 2010).

In support of existing literature, maize appeared to form the staple food of the community where we conducted our study (Martins 2005). Depending on the time of day, maize were seemingly served in different forms and with different side dishes (Kimani-Murage *et al.* 2010; Oldewage-Theron, Dicks and Napier 2006; Taylor and Jinabhai 2001). In our effort to understand the community's food consumption practices, the finding that community members obtained their food from donations, local shops and vendors, the dumping site, and local community-based vegetable gardens, provided some explanation for the food choices typically made. The findings of our study align with the findings of D'Haese and Van Huylenbroeck (2005), who found that vendors and local shops are central food supplying agents in resource-constrained communities, and furthermore that many households have a preference for supermarkets in towns nearby, as supermarkets can typically provide a wider variety of cheaper food. Closely related, the participants of our study emphasised that community members' choice of shop is strongly affected by the affordability and quality of items that are available. This finding correlates with the findings of the United Nations (United Nations 2013) who found that consumers from poor households are often attracted by quality, price and the availability of products in supermarkets.

We further found that, in terms of food production practices, the participants in our study seemingly preferred to grow their own vegetables, as vegetables are regarded as affordable and healthy. Our finding in this regard aligns with that of a study by Green, Botha and Schönfeldt (2004), indicating that household vegetable gardens are sometimes present in poor communities, despite access to running water being limited. D'Haese and Van Huylenbroeck (2005, 109) also indicate that, even though "additional vegetables come from community members' own gardens", the capacity of local production is limited.

In terms of food preparation practices, participants were of the view that community members preferred very specific food preparation practices. Participants emphasised that, despite the community being resource-constrained, most community members made use of electric stoves to prepare their food. This finding contradicts the study of Chirwa *et al.* (2010) who found that most of the households in their study preferred firewood for cooking, while electricity was mostly used for lightning. These authors (Chirwa *et al.* 2010) furthermore found that firewood was preferred for food that takes long to prepare, while electric stoves were used for short periods of cooking and re-heating of food.

As part of the study we conducted the participants indicated specific nutrition-related needs in terms of knowledge and skills required to practice healthy food-related behaviour. Participants divided the community's needs in terms of food production, food choice, and food preparation practices, for which the community reportedly required information on healthy eating. In a similar resource-constrained community setting, Green, Botha and Schönfeldt (2004) identified personal hygiene and sanitation practices, food security, dietary diversity and food coping strategies as specific needs of the community. Similar to our study, these authors included the identified needs in their developed health promotion intervention, focusing on various strategies such as educational materials, games, competitions, household vegetable gardens and the processing of surplus foods (Green, Botha and Schönfeldt 2004).

In developing the Win-LIFE intervention, we considered the data generated by means of the focus group discussion, semi-structured interviews, PRA-based workshops and *ad hoc* conversations. Participants agreed that the current school curriculum could be enriched by content on a balanced diet, the food pyramid, and health care (specifically in the form of hygiene and physical activity). Participants also indicated vegetable gardening skills as important part of the Win-LIFE intervention, which include irrigation, pest-control, different soil types and crop rotation. Participants agreed that attention should be paid to season-related issues regarding the production and preservation of foods.

In addition to being guided by the participants' needs and ideas when developing the Win-LIFE intervention, we also followed guidelines for the development of school-based health promotion and education interventions,

as suggested by existing school-based interventions (Roseman, Riddell and Haynes 2011). In developing the Win-LIFE intervention we included all suggested guidelines, except those on multimedia technology and learner self-assessments.

Warwick, Mooney and Oliver (2009) furthermore indicate that successful health promotion and education interventions build on health-related community-wide needs, concerns and perspectives of community members, is responsive to aspects such as gender, age and vulnerability, is interactive and practice-based in nature, and will enable participants to acquire health-related knowledge and skills. When assessing the Win-LIFE intervention against these suggestions, the intervention we developed aligns with the suggestions made by Warwick, Mooney and Oliver (2009). Following the development of the intervention it is currently being implemented in the three participating schools. Even though we have aimed to develop an intervention that may promote health and well-being in a poor community, the effect of the intervention will only be determined during the monitoring and evaluation phase of the study (late 2015 and 2016).

10. Conclusion

Health promotion and education interventions play an essential role in promoting healthy food- and nutrition-related patterns. Such interventions may assist communities in gaining insight into suitable combinations of food that can in turn support a balanced diet. In addition, community members may gain skills and become motivated to make healthy decisions in terms of food-related patterns and food consumption behaviour.

Primary schools can be regarded as suitable for implementation of health promotion and education interventions, and as one of the most important contexts where lifestyle habits and attitudes are being developed or may be informed by, for example, health promotion interventions. An underlying assumption of our research was that, if learners were exposed to school-based nutrition and environmental education, they could potentially share newly gained knowledge and skills with their family environments and subsequently facilitate change in terms of the health and well being of the broader community. To be more specific, if learners could promote positive food consumption practices, dietary patterns, farming and lifestyle habits, food security and nutrition-related needs, food insecurity may be alleviated in poor communities.

As such, schools may then serve as sites for social change, where learners and parents can be sensitised to incorporate positive and changed patterns of behavior in their lives. In this manner, schools can be used as vehicles to facilitate adjusted behavior in poor communities, in an attempt to increase food security and enhance levels of nutrition. Against the background of the global proportion of individuals living in extreme poverty, with women and children being affected the most (Statistics South Africa 2013; United

Nations 2013), this chapter attempted to demonstrate the development and characteristics of an interdisciplinary school-based health promotion and education intervention. As such, we aimed to provide an example of a potential way of addressing food insecurity and unhealthy behavioural patterns in resource-constrained communities. As learners spend most of their day at school, and considering worldwide growth in primary school enrolments, primary school settings offer an ideal and critical setting for effective interventions, with specific reference to health and nutrition-related aspects (Forneris *et al.* 2010; Naidoo and Coopoo 2012). We furthermore explained the manner in which community coalitions, within a framework of PRA research, informed and enriched the specific content of the developed Win-LIFE intervention.

References

- Anderson, S.A. 1990. Core indicators of nutritional state for difficult-to-sample populations. *Journal of Nutrition*, 120: 1559–1600.
- Angrosino, M. and Mays de Pérez, K. A. 2000. Rethinking observation: From method to context. *In:* Denzin, N. K. and Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research*. 3rd ed. USA: SAGE Publications.
- Braun, V. and Clarke, V. 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2): 77–101.
- Boothroyd, R. I., Fawcett, S.B. and Foster-Fishman, P.G. 2004. Community development: Enhancing the knowledge base through participatory action research. *In:* Jason, L. A., Keys, C. B., Suarez-Balcazar, Y., Taylor, R.R., and Davis, M. I. (Eds.), 2004. *Participatory community research: Theories and methods in action*. *APA decade of behaviour volumes*. Washington, DC,: American Psychological Association.
- Bourne, L. T., Lambert, E. V, and Steyn, K. 2002. Where does the black population of South Africa stand on the nutrition transition? *Public Health Nutrition*, 5(1A):157–62.
- Bradshaw, D, and Steyn, K. 2001. *Poverty and chronic diseases in South Africa*.
- Butterfoss, F.D. 2004. The coalition technical assistance and training framework: helping community coalitions help themselves. *Health Promotion Practice*, 5(2): 118–126.
- Butterfoss, F.D. and Kegler, M.C. 2012. A coalition model for community action. *In:* Minkler, M. (Ed.), 2004. *Community organizing and community building for health and welfare*. USA: Rutgers University Press.
- Byrd, D., Arentoft, A., Scheiner, D., Westerveld, M. and Baron, I.S. 2008. State of multicultural neuropsychological assessment in children: Current research issues. *Neuropsychology Review*, 18(3): 214–222.
- Caprio, S., Daniels, S.R., Drewnowski, A., Kaufman, F.R., Palinkas, L.A., Rosenbloom, A.L. and Schwimmer, J. B. 2008. Influence of race, ethnicity, and

- culture on childhood obesity: Implications for prevention and treatment. *Obesity Journal*, 16(12): 2566–2577.
- Casey, D. 2007. Using action research to change health-promoting practice. *Nursing and Health Sciences*, 9(1): 5–13.
- Chambers, R. 2004. Critical reflection and future directions: A personal note. *Participatory learning and action*, 50: 23–24.
- Chan, Y.C., Lam, G.L.T. and Cheng, H.C.H. 2009. Community capacity building as a strategy of family violence prevention in a problem-stricken community: A theoretical formulation. *Journal of Family Violence*, 24(8): 559–568.
- Chirwa, P.W., Ham, C., Mphiri, S. and Balmer, M. 2010. Bioenergy use and food preparation practices of two communities in the Eastern Cape Province of South Africa. *Journal of Energy in South Africa*, 21(4): 26–31.
- Creswell, J.W. 2012. *Qualitative inquiry and research design: Choosing among five approaches*. Thousand Oaks: SAGE Publications.
- Crosby, R.J., Kegler, R.A. and DiClemente, M. 2009. *Emerging theories in health promotion practice and research*. USA: Jossey-Boss publications.
- Darmon, N. and Drewnowski, A. 2008. Does social class predict diet quality? *The American Journal of Clinical Nutrition*, 87(5): 1107–1117.
- De Lange, N., Mitchell, C. and Stuart, J. (Eds.) 2007. *Putting people in the picture: Visual methodologies for social change*. Rotterdam: Sense.
- Denzin, N.K. and Lincoln, Y. S. 2005. *The SAGE handbook of qualitative research*. 4th ed. Thousand Oaks, CA: SAGE Publications.
- Denzin, N., and Lincoln, Y. 2000. Introduction: The discipline and practice of qualitative research. *In*: Denzin, N. K. and Lincoln, Y. S. (Eds.), *The sage handbook of qualitative research*. 3rd ed. SAGE Publications.
- Department of Agriculture. 2002. *The integrated food security strategy for South Africa*. Pretoria: Government Printers.
- Department of Basic Education. 2013. *National school nutrition programme: Questions and answers*. Pretoria: Government Printers.
- . 2011. *Action plan to 2014: Towards the realisation of schooling 2025*. Pretoria: Government Printers.
- . 2010. *The best of the national school nutrition programme*. Pretoria: Government Printers.
- . 2009. *Action plan to 2014: Towards the realisation of schooling 2025*. Pretoria: Government Printers.
- Department of Education. 2009. *National school nutrition programme: A guide for secondary Schools*. Pretoria: Government Printers.
- Department of Health. 2013. *Roadmap for nutrition in South Africa 2013–2017*. Pretoria: Government Printers.

- . 2010. *Landscape analysis on countries' readiness to accelerate action to reduce maternal and child under-nutrition: Nationwide country assessment* in South Africa. Pretoria: Government Printers.
- . 2007. *HIV and AIDS and STI Strategic Plan for South Africa, 2007–2011 (Part 1)*. Pretoria: Government Printers.
- . 2005. *The national food consumption survey: Fortification baseline (NFCS-FB)*. Pretoria: Government Printers.
- Departments of Health and Basic Education. 2012. *Integrated school health policy*. Pretoria: Government Printers.
- De Villiers, A., Steyn, N.P., Draper, C.E., Fourie, J.M., Barkhuizen, G., Lombard, C.J., Dalais, L., Abrahams, Z. and Lambert, E.V. 2012. "HealthKick": Formative assessment of the health environment in low-resource primary schools in the Western Cape Province of South Africa. *BMC Public Health*, 12(794): 3–11.
- D'Haese, M. and Van Huylbroeck, G. 2005. The rise of supermarkets and changing expenditure patterns of poor rural households case study in the Transkei area, South Africa. *Food Policy*, 30: 97–113.
- Eberlein, E. 2013. Bestuur van die Nasionale Skoolvoedings program in hulpbronarm skole in Limpopo praktyk, suksesse en uitdagings. *Suid-Afrikaanse Tydskrif Vir Natuurwetenskap En Tegnologie*, 32(1): 1–9.
- El Ansari, W. 2012. Leadership in community partnerships: A South African study and experience. *Central European Journal of Public Health*, 20(3): 174–184.
- . 2005. Collaborative research partnerships with disadvantaged communities: challenges and potential solutions, *Public Health*, 119(9): 758–780.
- El Ansari, W., Oskrochi, R. and Phillips, C. 2009. Engagement and action for health: The contribution of leaders' collaborative skills to partnership success. *International Journal of Environmental Research in Public Health*, 6(1): 361–381.
- El Ansari, W. and Phillips, C.J. 2001. Inter-professional collaboration: A stakeholder approach to evaluation of voluntary participation in community partnerships. *Journal of Interprofessional Care*, 15(4): 351–368.
- Erwin, K., Blumenthal, D.S., Chapel, T., Richardson, L. and Allwood, V. 2004. Building an Academic-community partnership for increasing representation of minorities in the health professions. *Journal of Health Care for the Poor and Underserved*, 15(5): 589–602.
- Faber, M. and Wenhold, F. 2007. Nutrition in contemporary South Africa. *Water SA*, 33(3): 393–400.
- Faber, M., Jogessar, V.B. and Benadé, A. J. 2001. Nutritional status and dietary intakes of children aged 2–5 years and their caregivers in a rural South African community. *International Journal of Food Sciences and Nutrition*, 52(5), 401–411.

- Faber, M., Witten, C. and Drimie, S. 2010. Community-based agriculture interventions in the context of food and nutrition security in South Africa. *South African Journal of Clinical Nutrition*, 24(1): 21–30.
- Fanzo, J. C. and Pronyk, P. M. 2011. A review of global progress toward the Millennium Development Goal 1 hunger target. *Food and Nutrition Bulletin*, 32(2), 144–158.
- Farquhar, S.A., Parker, E.A., Schulz, A.J. and Israel, B.A. 2006. Application of qualitative methods in program planning for health promotion interventions. *Health Promotion Practice*, 7(2), 234–242.
- Feeley, A., Musenge, E., Pettifor, J.M., & Norris, S.A. 2012. Changes in dietary habits and eating practices in adolescents living in urban South Africa: The birth to twenty cohort. *Nutrition*, 28(7–8), E1–E6.
- FAO of the United Nations. 2013. *The Millennium Development Goals Report 2013*. New York: United Nations.
- Fritz, E. and Smit, B. 2008. Ethnographic narratives challenging problem saturated stories of teacher inefficiency. *Education As Change*, 12(2): 155–169.
- Forneris, T., Fries, E., Meyer, A., Buzzard, M., Uguy, S., Ramakrishnan, R., Lewis, C. and Danish, S. 2010. Results of a rural school-based peer-led intervention for youth: Goals for health. *Journal of School Health*, 80(2): 57–65.
- Gannon-Leary, P., Baines, S. and Wilson, R. 2006. Collaboration and partnership: a review and reflections on a national project to join up local services in England. *Journal of Interprofessional Care*, 20(6): 665–674.
- Granner, M.L. and Sharp, P.A. 2004. Evaluating community coalition characteristics and functioning: A summary of measurement tools. *Health Education Research*, 19(5): 514–532.
- Green, J. 2004. Health promotion – what’s in a name? *IUHPE – Promotion and Education*, 11(1): 1–3.
- Green, C., Botha, P. and Schönfeldt, H.C. 2004. Needs assessment in a rural community on a commercial farm in South Africa. *Tydskrif Vir Gesinsekologie En Verbruikerswetenskappe*, 32: 46–59.
- Government of the Republic of South Africa. 1996. *Constitution of the Republic of South Africa*. Pretoria: Government Printers.
- Hotz, C. and Gibson, R.S. 2007. Traditional food-processing and preparation practices to enhance the bioavailability of micronutrients in plant-based diets. *Journal of Nutrition*, 137(4): 1097–1100.
- Howat, P., Maycock, B., Cross, D., Collins, J., Jackson, L., Burns, S. and James, R. 2003. Towards a more unified definition of health promotion. *Health Promotion Journal of Australia*, 14(2): 82–85.
- Hughes, I. 2008. Action research in healthcare. **In:** P. Reason and H. Bradbury (Eds.), *Handbook of action research: Participative inquiry and practice*. London: SAGE Publications.

- Hyslop, G. 2012. The time has come: food security. *South African Food Review*, 7(39): 18–22.
- Kadushin, C., Lindholm, M., Ryan, D., Brodsky, A. and Saxe, L. 2005. Why is it so difficult to form effective community coalitions? *City and Community*, 4(3): 255–175.
- Kelliher, F. 2005. Interpretivism and the pursuit of research legitimisation: An integrated approach to single case design. *The Electronic Journal of Business Research Methodology*, 3(2): 123–132.
- Kimani-Murage, E. W., Kahn, K., Pettifor, J. M., Tollman, S. M., Dunger, D. B., Gómez-olivé, X. F., and Norris, S. A. 2010. The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children. *BMC Public Health*, 10: 158–170.
- Krueger, R.A. 1994. *Focus groups: A practical guide for applied research*. USA: SAGE Publications.
- Kruger, R., Kruger, H. S. and MacIntyre, U.E. 2006. The determinants of overweight and obesity among 10 to 15 year old school children in the North West Province, South Africa: The THUSA BANA (Transition and Health during Urbanisation of South Africans; BANA, children) study. *Public Health Nutrition*, 9(3): 351–358.
- Kruger, H.S., Puoane, T., Senekal, M. and van der Merwe, M.T. 2007. Obesity in South Africa: Challenges for government and health professionals. *Public Health Nutrition*, 8(05): 491–500.
- Labadarios, D., Steyn, N.P. and Nel, J. 2007. How diverse is the diet of adult South Africans? *Nutrition Journal*, 10(33): 1–11.
- Labadarios, D., Davids, Y.D., Mchiza, Z. and Weir-Smith, G. 2009. *The assessment of food insecurity in South Africa*. Human Sciences Research Council: Centre for Poverty, Employment and Growth.
- Larson, N. and Story, M. 2009. A review of environmental influences on food choices. *Annals of Behavioral Medicine*, 38(1): 56–73.
- Leach, F. 2003. Researching gender violence in schools: Methodological and ethical considerations. *World Development*, 34(6): 1129–1147.
- Lune, H. and Berg, B. L. 2012. *Qualitative research methods for the social sciences*. USA: Pearson Education Inc.
- Lincoln, Y. and Guba, E. 1985. *Naturalistic inquiry*. Beverly Hills, CA: SAGE Publications.
- Loots, M.C. 2011. *Teachers' implementation of an asset-based intervention for school-based psychosocial support*. Unpublished PhD diss., University of Pretoria.
- MacFarlane, A., Crawford, D., Ball, K., Savige, G. and Worsley, A. 2007. Adolescent home food environments and socioeconomic position. *Asia Pacific Journal of Clinical Nutrition*, 16(4): 748–756.

- MacIntyre, U.E., Kruger, H.S., Venter, C.S. and Vorster, H.H. 2002. Dietary intakes of an African population in different stages of transition in the North West Province, South Africa: The THUSA study. *Nutrition Research*, 22(3): 239–256.
- Malan, L.P. and Van Rooyen, E.J. 2010. Community partnerships – enhancing municipal food security policy. *Journal of Public Administration*, 5(1): 121–132.
- Martins, J.H. 2005. The household food budget of the wealthy and the poor in South Africa. *Journal of Family Ecology and Consumer Sciences*, 33: 37–45.
- Mayosi, B. M., Flisher, A. J., Lalloo, U. G., Sitas, F., Tollman, S. M., and Bradshaw, D. 2009. The burden of non-communicable diseases in South Africa. *Lancet*, 374(9693): 934–947.
- McMillan, J. and Schumacher, S. 2014. *Research in education*. 7th ed. London: Pearson Publications.
- Mkhize, X., Napier, C. and Oldewage-Theron, W. 2013. The nutrition situation of free-living elderly in Umlazi Township, South Africa. *Health SA Gesondheid*, 18(1): 656–663.
- Muller, E., Diab, R.D., Binedell, M. and Honsome, R. 2003. Health risk assessment of kerosene usage in an informal settlement in Durban, South Africa. *Journal of Atmospheric Environment*, 37(15): 2015–2022.
- Naidoo, R. and Coopoo, Y. 2012. The impact of a primary school physical activity intervention in KwaZulu-Natal, South Africa: Health and physical activity. *African Journal of Physical Health Education, Recreation and Dance*, 18(1): 75–85.
- Netshitenzhe, J. 2007. *Development indicator mid-term review*. Pretoria: The Presidency, Republic of South Africa.
- Oldewage-Theron, W.H., Dicks, E.G. and Napier, C.E. 2006. Poverty, household food insecurity and nutrition: Coping strategies in an informal settlement in the Vaal Triangle, South Africa. *Public Health*, 120(9): 795–804.
- Onwuegbuzie, A.J. and Leech, N.L. 2007. An array of qualitative data analysis tools: A call for data analysis triangulation. *School Psychology Quarterly*, 22(4): 557–584.
- Orech, F. O., Christensen, D. L., Larsen, T. and Friis, H. 2007. Mineral content of traditional leafy vegetables from western Kenya. *International Journal of Food Sciences and Nutrition*, 58(8): 595–602.
- Oseji, M. and Okolo, A. 2011. School Health Services and Millennium Development Goals. *International Journal of Collaborative Research on Internal Medicine and Public Health*, 3(5): 378–384.
- Patton, M. Q. 2002. *Qualitative research and evaluation methods*. 3rd ed. Thousand Oaks: SAGE Publications.

- . 2001. Evaluation, knowledge management, best practices, and high quality lessons learned. *American Journal of Evaluation*, 22(3): 329–336.
- . 1994. Developmental Evaluation. *Evaluation Practice*, 15(3): 311–319.
- . 1990. *Qualitative evaluation and research methods*. 2nd ed.. Thousand Oaks, CA, US: Sage Publications.
- Peu, M.D. 2014. Health promotion strategies for families with adolescents orphaned by HIV and AIDS. *International Nursing Review*, 1–9.
- Popkin, B.M., Adair, L.S., and Ng, S.W. 2011. Global nutrition transition and the pandemic of obesity in developing countries. *Nutrition Reviews*, 70(1): 3–21.
- Power, T.J. and Blom-Hoffman, J. 2004. The school as a venue for managing and preventing health problems: Opportunities and challenges. *In*: Brown, R. T. (Ed.), *Handbook of pediatric psychology in school settings*. USA: Lawrence Erlbaum Associates Publishers.
- Puoane, T., Matwa, P., Bradley, H. and Hughes, G. 2006. Socio-cultural factors influencing food consumption patterns in the black African population in an urban township in South Africa. *Human Ecology*, 14: 89–93.
- Radimer, K.L., Olson, C.M. and Campbell, C.C. 1990. Development of indicators to assess hunger. *Journal of Nutrition*, 120: 1544–1548.
- Roseman, M. G., Riddell, M. C. and Haynes, J. N. 2011. A content analysis of kindergarden-12th grade school-based nutrition interventions: Taking advantage of past learning. *Journal of Nutrition Education and Behaviour*, 43(1): 2–18.
- Roussos, S.T. and Fawcett, S.B. 2000. A review of collaborative partnerships as a strategy for improving community health. *Annual Review of Public Health*, 21: 369–402.
- Schönfeldt, H.C., Gibson, N. and Vermeulen, H. 2010. News and views: The possible impact of inflation on nutritionally vulnerable households in a developing country using South Africa as a case study. *Nutrition Bulletin*, 35(3): 254–267.
- Severi, S., Bedogni, G., Manzieri, A. M., Poli, M., Gatti, G., and Battistini, N. (1998). Effects of home-based food preparation practices on the micronutrient content of foods. *European Journal of Cancer Prevention*, 7: 331–335.
- Smith, F. I. and Eyzaquirre, P. 2007. African leafy vegetables: Their role in the World Health Organization’s global fruit and vegetable initiative. *African Journal of Food, Agriculture, Nutrition and Development*, 7(3): 1684–5374.
- Statistics South Africa. 2013. *Millennium Development Goals: Country Report*. Pretoria: Statistics South Africa.
- St. Clair, S.B., and Lynch, J.P. 2010. The opening of Pandora’s Box: climate change impacts on soil fertility and crop nutrition in developing countries. *Plant Soil*, 335: 101–115.
- Stephen, C.R., Bamford, L.J., Patrick, M.E. and Wittenberg, D.F. 2011. *Saving Children 2009: Five years of data. A sixth survey of child healthcare in South*

Africa. Pretoria: Tshepesa Press, Medical Research Council and Centres for Disease Control and Prevention.

Steyn, N.P., Lambert, E.V., Parker, W., Mchiza, Z. and De Villiers, A. 2004. A review of school nutrition interventions globally as an evidence base for the development of the HeathKick programme in the Western Cape, South Africa. *Journal of Clinical Nutrition*, 22(3): 144–152.

Sotshongaye, A. and Møller, V. 2000. We want to live a better life like other people: Self-assessed development needs of rural women in Ndwedwe, KwaZulu-Natal. *Development Southern Africa*, 17(1): 117–134.

Steyn, N., Myburgh, N., and Nel, J. 2003. Policy and Practice: Evidence to support a food-based dietary guideline on sugar consumption in South Africa. *Bulletin of the World Health Organization*, 81(8): 599–608.

Steyn, N.P., Nel, J.H., and Casey, A. 2006. Secondary data analyses of dietary surveys undertaken in South Africa to determine usual food consumption of the population. *Public Health Nutrition*, 6(7): 631–644.

Stokols, D., Fuqua, J., Gress, J., Harvey, R., Phillips, K., Unger, J., Palmer, P., Clark, M.A., Colby, S.M., Morgan, G. and Trochim, W. 2003. Evaluating transdisciplinary science. *Nicotine and Tobacco Research*, 5(1): S1–S39.

Stokols, D. 1995. The paradox of environmental psychology. *American Psychologist*, 50(10): 821–837.

Stokols, D. 1996. Translating Social Ecological Theory into guidelines for community Health promotion. *American Journal of Health Promotion*, 10(4): 282–298.

Story, M., Kaphingst, K.M. and French, S. 2006. The role of child care settings in obesity prevention. *The Future of Children*, 16(1): 143–168.

Sutton, S. and Kemp, S. 2006. Integrating social science and design inquiry through interdisciplinary design charrettes: An approach to participatory community problem solving. *American Journal of Community Psychology*, 38(1): 125–139.

Suzuki, L.A., Ahluwalia, M.K., Arora, A.K. and Mattis, J.S. 2007. The pond you fish in determines the fish you catch: Exploring strategies for qualitative data collection. *The Counselling Psychologist*, 35(2): 295–327.

Tang, K.C., Beaglehole, R. and O’Byrne, D. 2005. Policy and partnership for health promotion: Addressing the determinants of health. *Bulletin of the World Health Organization*, 83(12): 884–885.

Taylor, M. and Jinabhai, C. 2001. Working with community health workers to improve nutrition in rural KwaZulu-Natal. *Development Southern Africa*, 18(2): 125–140.

Temple, N.J. and Steyn, N.P. 2011. The cost of a healthy diet: A South African perspective. *Nutrition*, 27(5): 505–508.

Temple, N.J., Steyn, N.P., Fourie, J. and De Villiers, A. 2011. Price and availability of healthy food: A study in rural South Africa. *Nutrition*, 27(1): 55–58.

- Temple, N.J., Steyn, N.P., Myburgh, N.G., and Nel, J.H. 2006. Food items consumed by students attending schools in different socioeconomic areas in Cape Town, South Africa. *Nutrition*, 22(3): 252–258.
- Terre Blanche, M. and Durrheim, K. 2002. Histories of the present: Social science in context. **In:** Terreblanche, M. and Durrheim, K. (Eds.), *Research in practice: Applied methods for the social sciences*. Cape Town: University of Cape Town Press.
- Terre Blanche, M. and Kelly, K. 2002. *Research in practice: Applied methods for the social sciences*. 2nd edition. UCT: University Press.
- United Nations. 2013. *The Millennium Development Goals Report 2013*. New York: United Nations.
- United Nations. 2012. The cost of hunger in Africa: Social and economic impact of child under-nutrition. Meeting of the Committee of Experts of the 5th Joint Annual Meeting of the AU Conference of Ministers of Economy and Finance and ECA Conference of African Ministers of Finance, Planning and Economic Development. Addis Ababa, Ethiopia, 22–25 March 2012.
- . 2010. *The state of food insecurity in the world: Addressing food insecurity in protracted crisis*. Rome: FAO of the UN
- . 1989. *Convention on the Rights of the Child*. Switzerland: Office of the UN High Commissioner for Human Rights.
- Von Maltzahn, R. and Van Der Riet, M. 2006. A critical reflection on participatory methods as an alternative mode of enquiry. *New Voices in Psychology*, 2(1): 108–128.
- Voorend, C.G.N., Norris, S., Griffiths, P.L., Sedibe, M.H., Westerman, M.J. and Doak, C.M. 2013. “We eat together; today she buys, tomorrow I will buy the food”: Adolescent best friends’ food choices and dietary practices in Soweto, South Africa. *Public Health Nutrition*, 16(3): 559–567.
- Vorster, H.H. 2010. The link between poverty and malnutrition: A South African perspective. *Health SA Gesondheid*, 15(1): 1–6.
- Vorster, H.H., Venter, C.S., Wissing, M.P., and Margetts, B.M. 2007. The nutrition and health transition in the North West Province of South Africa: A review of the THUSA (Transition and Health during Urbanisation of South Africans) study. *Public Health Nutrition*, 8(5): 480–490.
- Wandersman, A. and Florin, P. 2003. Community interventions and effective prevention. *American Psychologist*, 58(6): 441–448.
- Warwick, I., Mooney, A. and Oliver, C. 2009. *National healthy schools programme: Developing the evidence base*. Thomas Coram Research Unit, Institute of Education, University of London.
- Watson-Thompson, J., Fawcett, S.B. and Schultz, J.A. 2008. Differential effects of strategic planning on community change in two urban neighbourhood coalitions. *American Journal of Community Psychology*, 42:25–38. Watson-Thompson, J. 2007. *Analyzing the contributions of a community coalition in*

an urban neighborhood in Kansas City, Missouri: An empirical case study of the Ivanhoe Neighborhood Council. USA: ProQuest Information and Learning Company.

Wenhold, F.A.M., Faber, M., Van Averbek, W., Oelofse, A., Van Jaarsveld, P., Jansen van Rensburg, W.S., Van Heerden, I. and Slabbert, R. 2007. Linking smallholder agriculture and water to household food security and nutrition. *Water SA*, 33(3): 327–336.

Wolf, T. 2001. A practitioner's guide to successful coalitions. *American Journal of Community Psychology*, 29(2): 173–191.

World Health Organization (WHO). 2006. *The World Health Report 2006: Working together for health.* Geneva: WHO.

———. 1996. *The World Health Report 1996 : Fighting disease, fostering development.* Geneva: WHO.

Yin, R.K. 2012. *Case study research: Design and methods.* Thousand Oaks: SAGE Publications.

Zakocs, R.C. and Edwards, E.M. 2006. What explains community coalition effectiveness: A review of the literature. *American Journal of Preventative Medicine*, 30(4): 351–361.

Zuber-Skerritt, O. and Fletcher, M. 2007. The quality of an action research thesis in the social sciences. *Quality Assurance in Education*, 15(4): 413–436.

CHAPTER FIVE

Harnessing Indigenous and Scientific Knowledge to Promote Farmer Multi-Stakeholder Partnerships in Food Security in Kakamega County, Kenya

Boaz S. W. Maloba

Abstract

Kenya's economic and social development challenges include unemployment, poverty and food insecurity. Kenya, like most countries in the Intergovernmental Authority on Development region, is one of the most food-insecure in the world. Agricultural research has come up with interventions and innovations applicable to African farming systems that are expected to simultaneously increase yields and resilience to climate change. However, most of the innovations that have been adopted take a top-down approach as dictated by international aid agencies and national governments ignoring the potential of local innovations and resources. Secondly, the failure to recognise the roles, differences and inequities between men and women in agricultural production has posed a serious threat to the effectiveness of agricultural development strategies. This study was designed to harness indigenous and scientific knowledge with a view to promoting food security in Kakamega County, an area that has persistently suffered from food insecurity in spite its favourable climate and fertile soils. The conceptual framework adopted for this study is the Agricultural Knowledge Information Systems/Rural Development by Riveria and Zijn (2005). A mixed methods research approach with Rapid Appraisal of Agricultural Knowledge Systems research design was adopted. The sample size was 60 participants with 46 farmers participating in focus group discussions while 14 stakeholders in the Agricultural Knowledge Information Systems gave in-depth interviews. The findings revealed that Agricultural Indigenous Knowledge exists but it is rarely appreciated for lack of appropriate channels to disseminate it. It emerged that gender-power dynamics play a pivotal role in food (in)security in Kakamega County. I propose the integration of Indigenous Agricultural Knowledge into modern scientific knowledge as an innovation that will lead to sustainable food security in Kakamega County. I have also critiqued the Riveria and Zijn model and incorporated the gender-power dynamics at the heart of the conceptual model flanked by the Integrated Agricultural Knowledge Information Systems with media as the driving force.

Keywords: Agricultural Knowledge Information Systems, food (in)security indigenous knowledge, innovation, rural farmers, stakeholders

1. Introduction

1.1 Background of the Study

With the hunger reduction target of the Millennium Development Goal 1c- of halving the proportion of undernourished people in the developing countries by the year 2015 unlikely to be achieved in developing countries, there is need to rethink strategies that will innovatively and sustainably ensure global food security (FAO 2014). It has also been noted that achieving food security is a significant and growing challenge in the developing world and highly critical to alleviating poverty (CIDA 2010). By 2050, there will be 9 billion people to be fed globally, thus the necessity for production of more food (EU SCAR 2012). FAO (2012) asserts that food production must increase by 70 per cent by 2050 to keep pace with the increasing demand for food. Food security entails availability, access and utilisation by all men and women irrespective of age, ethnicity or religion. According to FAO, IFAD and WFP (2014), 805 million people were estimated to be chronically undernourished in 2012–14, down from more than 100 million over the last decade. The prevalence of undernourishment has fallen from 18.7 per cent to 13.5 per cent globally and from 23.4 per cent to 13.5 per cent in developing countries (FAO 2014). Despite the overall progress in developing countries as a whole, large differences remain across regions (*ibid.*). The Sub-Saharan Africa (SSA) region where one in four people remain under- nourished is making slow progress in achieving international hunger-reduction targets due to a myriad of conflicts and natural disasters (UNDP 2014; FAO 2014).

As scientists struggle to respond to global challenges, they have increasingly distanced themselves from local innovative ways of solving problems (Mkapa 2004). FAO recognises that in developed and developing countries, farmers and local communities have had traditional knowledge, expertise, skills and practices related to food security and agricultural production and diversity (FAO 2009). Indigenous knowledge (IK) is a resource that can help to: solve local problems; grow more, better food; maintain healthy lives; share wealth; prevent conflict; manage local affairs; and contribute to global solutions (Mkapa 2004). The fundamental roles of IK in sustaining livelihoods of African poorest people have often been neglected in the agricultural and rural development sector (Kyeyune *et al.* 2012). Agriculture comprises the largest collection of indigenous knowledge (Aluma 2004), as farmers and pastoralists have grown crops and kept animals, developed production systems well adapted to those locations and the changes in the environment. It is necessary to tap into such indigenous sources for the formulation and utilisation of technologies that would assist in meeting the material needs of the African rural people today (Kunnie 2005).

Agriculture is central to livelihoods and is a primary source of economic prosperity, human health and social well-being and is an important engine of growth and poverty reduction (FAO 2012; UNDP 2014). Nonetheless, the sector is underperforming in many countries in part because women, who are often a crucial resource in agriculture and the rural economy, face constraints that reduce their productivity (*ibid.*). In developing countries, women and girls are the most susceptible to the impacts of food insecurity because they have less access to and control over resources than men (CIDA 2010). Aggregate data shows that women comprise about 43 per cent of the agricultural labour force globally and in developing countries (FAO 2012; Beyene and Nemera 2014). But this figure masks considerable variation across regions and within countries according to age-group and social class. Overall, the labour burden of rural women exceeds that of men, and includes a higher proportion of unpaid household responsibilities related to preparing food and collecting fuel and water (*ibid.*). Available data on rural and agricultural feminisation shows that this is not a general trend but mainly a sub-Saharan Africa phenomenon (FAO 2012). The 2012 World Development Report dedicated to *Gender Equality and Development* warns that failure to recognise the roles, differences and inequities between men and women poses a serious threat to effectiveness of agricultural development strategies (World Bank 2012; Kassie *et al.* 2012).

Kenya has the largest, most diversified economy in East Africa (World Bank 2013) with agriculture being the backbone of this and central to the government's development strategy. In fact, more than 75 per cent of Kenyans make some or part of their living in agriculture additionally, the sector accounts for more than half of the country's gross domestic product (GDP) (Kimani-Murage *et al.* 2006). However, agricultural productivity is stagnating as the population is rapidly growing with two to four million people receiving food aid annually (World Bank 2009). Only about 20 per cent of Kenyan land is suitable for farming and maximum yields have not been reached in these areas, leaving considerable potential for increases in productivity (World Bank 2014). Moreover, most farmers work without basic agricultural inputs, lack adequate financial and extension services and use outdated technology (*ibid.*).

Food insecurity, unemployment and poverty are among Kenya's main economic and social development challenges (Ministry of Agriculture 2005). According to USAID (2009a), Kenya like most countries in the region, is one of the most food insecure in the world. Arend (2011), further asserts that approximately 10 per cent of Kenya's population or 3.8 million people, live in a chronic state of food insecurity, the most vulnerable being women and children. Thirty-five per cent of children under 5 years old suffer from stunting and 16 per cent are underweight (World Bank 2009). Under nutrition

is estimated to cost Kenya approximately \$38.3 billion from 2010 to 2030 in GDP due to losses in workforce productivity. Additionally, gender inequalities and lack of attention to the role women play in agricultural development contributes to lower productivity, higher levels of poverty as well as under nourishment (World Bank 2009; Cotula *et al.* 2009; FAO 2012). In Kenya, women carry out up to 80 per cent of small-scale farming while men often dominate larger commercial activities (Fatma 2009). In as much as the involvement of women in the agricultural sector is critical, their control over the means of production and, in particular land ownership, is limited yet they are the most susceptible to the impacts of food insecurity

This study was conducted in Kakamega County, Western Kenya; an area that is endowed with great agricultural potential yet it has persistently experienced high food insecurity (RoK 2008). Kakamega County is one of Kenya's bread baskets, but has high malnutrition rates and a high number of Months of Inadequate Household Food Provisioning as shown by past studies (Fatma 2009; Ali-Olubandwa, Kathuri and Wesonga 2011; Injamu 2014). It is against this background that understanding the sustainable linkages between food insecurity, agricultural knowledge integration and gender dynamics for innovative practices becomes necessary. This chapter is organised into four sections: the first section is the introduction, which establishes the background and statement of the problem. The second section presents literature review and the conceptual framework of study. The third section deals with the methodology, followed by the findings and discussion while the last part is devoted to concluding remarks and the policy implications.

1.2. Statement of the Problem

The twin perils of global food insecurity and environmental degradation necessitate expanding resources and fostering innovation in agriculture to accelerate food production in a sustainable manner, while also supporting poverty reduction (Bodouroglou and Alarcón 2012). Achieving this will require increased recognition of the centrality of small-scale farming, short-term humanitarian action, and longer-term policies for sustainable agricultural innovation system (SAIS). Agricultural research has come up with interventions and innovations applicable to African farming systems that simultaneously will increase yields and resilience to climate change (Sanginga *et.al.* 2009). Most of the innovations adopted, however, take a top-down approach as dictated by international aid agencies and national governments ignoring the potential of local innovations and resources and in most cases they do not lead to sustainable food security (Tesfaye and Degefa 2009). Lack of integration between national policies and implementation mechanisms at the local level, such as investments in infrastructure to support farm to market

transportation and market access, limited extension services to ensure appropriation by farmers of new agricultural practices that could boost sustainable agricultural productivity are examples of important factors limiting improvements to food security (CIDA 2010).

The government and aid agencies see farmers as recipients of technologies identified and packaged by outsiders (Hall 2006). And yet, as much as the innovation may be valid, ignoring IK of the local community as not worthwhile(*sic*) leads to the failure of most innovations (Tesfaye 2003). Agricultural extension services on the other hand, are expected to be participatory but in most cases are delivery oriented rarely encouraging farmer innovation (Tesfahun and Amanuel 2003). Moreover, most researchers and development practitioners are seldom interested in building on successful Indigenous Knowledge (IK); neither do they recognise the dynamics of IK that emerge as local people confront new challenges (Tesfaye and Degefa 2009). Additionally, the agricultural knowledge generation is compartmentalised, bureaucratised and control-oriented (Opondo *et al.* 2009) with the actors involved in food systems not synchronising their activities. Thus, the researchers and academics are isolated from the farmers who are the end users of agricultural information.

The engagement of women in sustainable agricultural development is an often downplayed area, yet they are crucial in the translation of products of a vibrant agricultural sector into food and nutritional security of their households (Beyene and Nemera 2014). Women are the central drivers of change since 80 per cent of small scale farming is carried out by women in sub-Saharan Africa (CIDA 2010). Their work is not recorded in national statistics nor mentioned in reports and their contributions are poorly understood and often underestimated (Liru 2014). The questions that beg to be answered include; what formal and informal mechanisms can be put in place to stimulate agricultural innovations for sustainable food security? Secondly, what channels can best transfer this information to a wider population to enhance knowledge on sustainable food security? More importantly, how can the knowledge inherent in women be scaled up for better sustainable food security practices? Several researches have been done on indigenous agricultural knowledge (Kyeyune *et al.* 2012; Byaruhanga and Opedum 2010; World Bank 2004; FAO 2009). Other studies have been done on women involvement in food security (Kennedy 2008; Fatma 2009; Ali-Olubandwa, Kathuri and Wesonga 2011; Injamu 2014) but not much is known about integration and partnership of IK with modern scientific agricultural knowledge and the gender dynamics inherent in it. This research intended to narrow this knowledge gap.

1.3 Research Questions

This study aimed to answer the following research questions:

- i. What are the farmers' African Indigenous Knowledge Systems (AIKS) bases and gaps in Kakamega County?
- ii. What partnership efforts are in place to ensure that agricultural specialists work closely with indigenous communities to achieve sustainable food security?
- iii. What power-gender dynamics in food systems are demonstrated by the Kakamega County communities?
- iv. How is Agricultural Knowledge Innovation Systems (AKIS) communicated to the local communities and their actors?
- v. What strategies are in place to integrate agricultural indigenous knowledge and modern scientific technological knowledge on food security in Kakamega County?
- vi. What challenges do farmers face in integrating agricultural indigenous knowledge and modern scientific technological knowledge on food security in Kakamega County?

2. Literature Review

2.1. Linkage between Food Security and Agricultural Innovations

According to USAID, food security refers to access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: the ready availability of nutritionally adequate and safe foods, and an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies) (USAID 2013, 2). USAID further states that:

- Food availability is achieved when sufficient quantities of food are consistently available to all individuals within a country. Such food can be supplied through household production, other domestic output, commercial imports, or food assistance.
- Food access is ensured when households and all individuals within them have adequate resources to obtain appropriate foods for a nutritious diet. Access depends on income available to the household, on the distribution of income within the household, and on the price of food.
- Food utilisation is the proper biological use of food, requiring a diet providing sufficient energy and essential nutrients, potable water, and adequate sanitation. Effective food utilisation depends in large measure on knowledge within the household of food

storage and processing techniques, basic principles of nutrition and proper childcare, and illness management.

Achieving adequate food security is arguably a necessary first step toward the more general development objectives of improved human well-being, the alleviation of poverty, and sustainable, broad-based economic growth. On the other hand, according to FAO 1996, "Food insecurity is a condition in which a population does not have access to sufficient, safe and nutritious food over a given period to meet dietary needs and preferences for an active life. The World Food Summit defines food insecurity as a state of food security that leads to lack of physical and economic access to safe and nutritious food for an active and healthy life (FAO 2000).

The OECD defines innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations. This implies that innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations (OECD 2005). Innovation is a social process, more bottom-up or interactive than top-down from science to implementation. Social innovation refers not only to the social aspects of the innovation process, nor the objective it should achieve but also to the sustainable corporate sense of responsibility to solve social problems such as rural development and discrimination.

Agriculture and innovation go hand-in-hand that farmers have always innovated in working with nature when certain methods failed to produce the desired result. Even pure technical innovations are socially embedded in a process with clients, advisors. etc. Innovation may be brand new, but usually involves new combinations of existing knowledge where the ability to innovate is often related to the collective action and knowledge exchange among diverse actors, incentives and resources available for collaboration and having in place conditions that enable adoption and innovation by farmers or entrepreneurs (EU SCAR 2012). Innovation benefits from the exchange of ideas, learning and innovation networks have proven to be an adequate vehicle for empowering groups of farmers to investigate new options to make their business more viable and sustainable. The link between Agriculture and innovation is better captured by the definition of Roling and Engel (1991, 8–20) as a set of agricultural organisations, and or persons, and the links and interactions between them, engaged in the generation, transformation, transmission, storage, retrieval, integration, diffusion and utilisation of knowledge and information, with the purpose of

working synergistically to support decision making, problem solving and innovation in agriculture.

An innovation system can be defined as a network of organisations, enterprises and individuals focused on bringing new products, processes and forms of organisation into economic use together with institutions and policies that affect their behaviour and performance. It involves both the actors and science suppliers' of knowledge creation and its uptake (Hall 2006).

According to (Bergek *et al.* 2010), in the Systems of Innovation view, a well-developed knowledge and innovation system has seven functions:

1. Knowledge development and diffusion
2. Influence on direction of search and identification of opportunities
3. Entrepreneurial experimentation and management of risk and uncertainty
4. Market formation
5. Resource mobilisation
6. Legitimisation
7. Development of positive externalities

2.2 Agricultural Knowledge and Innovation Systems (AKIS)

The AKIS concept has been developed out of the old AKS (Agricultural Knowledge Systems) concept that originated in 1960s in scholarly work on agricultural advice and extension. That system was driven by an interventionist agricultural policy that sought to coordinate knowledge and innovation transfer in order to accelerate agricultural modernisation. In many countries, this was reflected in a strong integration of public research, education and extension bodies, often under the control of the Ministry of Agriculture (Röling and Engel 1991) In the 1970s, an 'I' was added to the AKS: "agricultural knowledge and information systems" (AKIS). This acronym has since its evolution used to represent agricultural knowledge and innovation systems" a concept that seeks to encompass and influence the complexity of knowledge and innovation processes in the rural sphere. AKIS help explain how information and knowledge flow (and how innovation takes place) and these processes can be strengthened.

Hall (2006) identifies eight characteristics of AKIS as follows:

1. **Purpose:** Strengthening communication and knowledge delivery services to rural people.
2. **Actors:** National agricultural research organisations, agricultural universities, extension services, farmers, NGOs and rural entrepreneurs.

3. **Outcome:** Technology adoption and innovation in agricultural production.
4. **Organising Principle:** Accessing agricultural knowledge.
5. **Mechanism for Innovation:** Interactive learning.
6. **Degree of Market Integration:** Low
7. **Role of Policy:** Enabling framework.
8. **Nature of Capacity Strengthening:** Strengthening communication among actors in rural areas.

These characteristics resonate with Rivera, Qamar and Mwandemera's (2005) conceptualisation of AKIS as presented in Figure 1.

2.3. Conceptual Framework

The conceptual framework adopted for this study is the AKIS/RD by Rivera and Zijp (2002) which sought to broaden the AKIS concept to include rural development RD (EU SCAR 2012). The model has been simplified by Hall (2006) by summarising the characteristics of AKIS. The model looks at four main actors with interest in agricultural/RD innovation: Research, Extension services, Education training and the support systems (all organisations providing credit, inputs and producers associations). In this model, the four sets of actors act upon the knowledge of the farmers, rural actors and generate innovations in response to problems and opportunities, desired out comes, system drivers and regulative policies and institutions. However, as the left hand of the figure shows, problems are not simply given by context; rather they are framed in different ways by specific paradigms such as the political, social, economic and climatic environment which are the conditions for initiating demand for the innovation , partnership and networking.

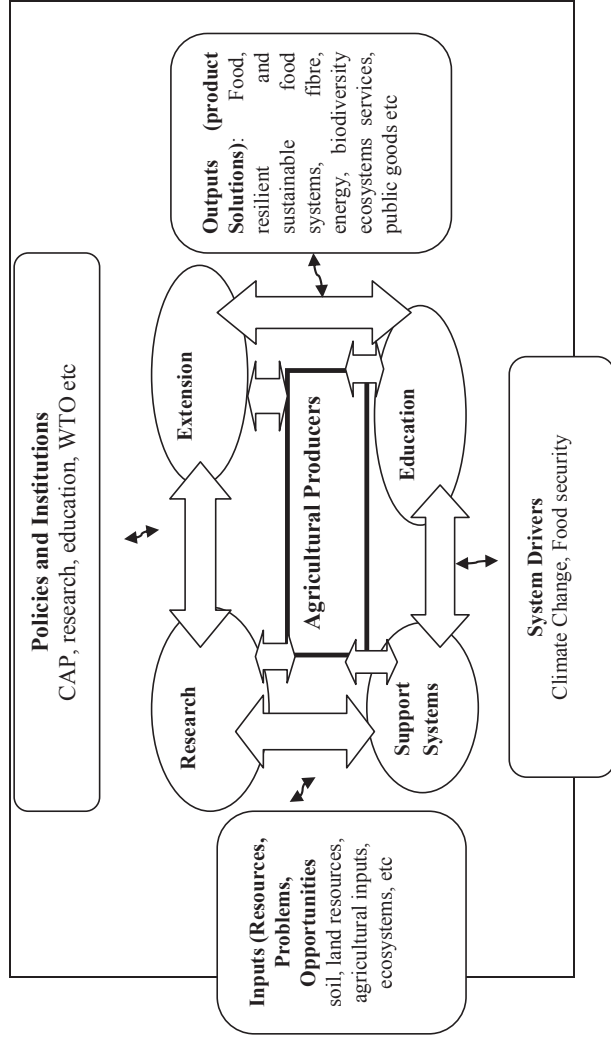


Figure 1. Conceptual Framework for AKIS
SOURCE: Adapted from EU SCAR (2012, 26).

The basic concept here is that with the partnership of all stakeholders (rural people, national organisations, NGOs policy-makers and the market dynamics taken into account, there will be increased agricultural productivity thus increasing food security which will enhance national growth. Most research institutions play a great role in innovations but most of these do not reach the local farmers (Rivera, Qamar and Mwandemera 2005). The private sector (NGOs) work with communities on the ground and yet their work goes unrecognised. In as much as research is linked to extension services, private sector and education in a cyclic motion, an innovation does not always start with research and knowledge. Research does not necessarily create new practice or values (Ammanuel *et al.* 2009). The knowledge needs to be translated into skills and technologies and, therefore, how this information is communicated is very important.

Klerkx and Leeuwis (2009) identify four drivers that contributed to the move (in thinking) from AKS to AKIS in explaining the above concept:

- Research, extension and education undergoing a deep restructuring, transformed by the trend towards liberalisation.
- Policy agenda: increasing concern over the environmental impact of industrial agriculture, the quality of life of rural populations, rural employment and the need to support the positive externalities linked to agricultural production.
- The linear model of innovation progressively being replaced by a participatory or ‘side by side’ network approach, in which innovation is ‘co-produced’ through interactions between all stakeholders in the food chain.
- Addressing the growing disconnect between farmers’ knowledge and research and extension systems. An AKIS should be able to propose and develop practical ideas to support innovation, knowledge transfer and information exchange. Innovation policy needs to reflect the manner in which innovation actually occurs today.

The drivers of innovations and change are mostly individuals, often acting in or through groups (women, youth, farmers, participants of an adult literacy training, and so forth) established through a common concern or interest, rather than formal structure. In most instances, the “innovators” have had contact with “global knowledge” to the extent that they could also better appreciate the knowledge and experience available within their own environment and realise the potential of change from within (Aluma 2004). From these revelations, the emphasis of AKIS is not commercialisation but small scale farmers who are more linked with natural resources such

as soil, water, vegetation and animals. Community empowerment and sustainability of the innovation are very important for food security. It must also be noted that in food insecure settings, the issue of markets is a second generation problem and both state and non-state actors concerned with food insecurity have paid little attention to it (Ammanuel *et al.* 2009). AKIS demands a radical political shift from strengthening research or extension institutions to strengthening linkages that should take place among system actors. It sees the farmer not as merely a recipient of technology from research via extension but rather all system actors have a stake in the process of generating, disseminating and using knowledge (Ammanuel *et al.* 2009; EU SCAR 2012).

2.4. African Indigenous Knowledge Systems

According to FAO (2009), in developed and developing countries all over the world, farmers and indigenous and local communities have traditional knowledge, expertise, skills and practices related to food security and to food and agricultural production and diversity. This acknowledgement resonates with Mkapa's (2004) assertion that long before their contact with Europe, Africans practiced various methods of agriculture. Africa had its own Indigenous Knowledge Systems (hereinafter referred to AIKS), which included social values, beliefs and practices that informed the African's various institutions. They grew crops and kept domestic animals like cattle, sheep, goats and chickens whose waste and manure are used to further enrich their soils. They relied on organic fertilisers which do not interfere with the natural ecosystem while growing crops that would thrive well in the respective climates. For example, drought-resistant crops like sorghum and millet were grown in the drier areas where rainfall is below 500mm per year. AIKS consisted of insect control, fertilisation, control of plant disease, weed control, food preparation, animal husbandry, plant propagation, soil conservation among others (Aluma 2004). Mixed cropping and intercropping were also practiced in traditional African societies (Kunnie 2000), ensuring abundance of food and maximum utilisation of land (Matowanyika, Garibaldi and Musimura 1995). However, this knowledge is rarely taken into consideration in the design and implementation of the modern mainstream knowledge in agricultural innovation and production (Tesfaye 2003). AIK is currently facing many challenges and it risks being completely phased out or being totally sidelined from the mainstream knowledge in food production (Mumbua 2010).

Capacity enhancement should not assume a vacuum of knowledge, skills and practice (Aluma 2004). Capacity enhancement efforts without the opportunity to apply that capacity enhancement in a local context is likely to be ineffective. Adults learn best when knowledge and skills gained are of direct relevance to the problems they are

seeking to solve. Incorporating all existing knowledge in food production is of much importance given the present state of food insecurity (Aluma 2004). Evidence suggests that in the event of severe shortages of major staples, many communities in Africa would revert (as short term survival mechanism) to traditional plants that have received little or no research attention. This indicates an underutilised potential. The AIK response to challenges of rural life appears to be a comprehensive approach that extends beyond the 'purely technical'; instead the community approach is embedded in a general response to issues relating to poverty, household food security, health, sustainable agriculture, off farm employment, social and human capital formation, access to institutions and social networks (Mkapa 2004).

The enhancement of IK is of great importance to the empowerment of local communities and their effective participation in the development process (Aluma 2004). A conducive environment to the valuation and promotion of indigenous knowledge practices not only enables institutions to utilise IK in a more rational and efficient manner, but also signals to the communities that their contributions to science and technology are valuable, possibly inducing more innovative creativity (*ibid.*). Aluma further asserts that researchers and policy makers need to understand better that livelihood practices are not just the manifestation of culture. Instead, there is a need to appreciate that indigenous practices are the outcome of "trial and error" research undertaken (and ongoing) by generations of practitioners in an environment that is not standardised. These indigenous practitioners largely chose not to protocol their results and avoided their dissemination across communities and borders in a systematic manner.

Many of the bearers of indigenous knowledge belong to the older generation and will take their knowledge with them once they pass on. Furthermore, demands to contribute to poverty reduction and food emergency prevention often require large-scale solutions while IK practices are localised and cannot be scaled up easily. Hence, research is concerned with the documentation of as many practices as possible or with selecting, at the risk of missing "the best," a limited number of practices, breeds or stock for dissemination and scale up. Nevertheless, successful scale-up is possible. This study sought to establish the types of agricultural indigenous knowledge available in Kakamega County, knowledge base and gaps of AKIS and enhancement of the promotion of capacity- building in Agricultural Information Knowledge Systems. It also seeks to systematically document the hybridisation of IK and modern scientific technological agricultural knowledge for Kakamega County.

2.5. Integration of Indigenous Knowledge and Modern Scientific Knowledge

In 2000, the President of the World Bank,, James D. Wolfensohn, remarked that indigenous knowledge is an integral part of the culture and history of a local community and that we need to learn from the local communities to enrich the development process (Ponge 2011). Ponge further emphasises Chambers' assertion (1983) that the integration of IK with modern scientific knowledge is important since the rural peoples' knowledge and the current scientific knowledge are complementary in their strengths and weaknesses and that combined, they may achieve what neither would alone. Ponge (2011) views IK as existing in a local context, anchored to a particular setting at a particular time. IK is developed and adapted continuously to gradually changing environments and passed down to generations and closely interwoven with peoples cultural values. There are several positive African traditional agricultural practices that have been adapted and passed down over countless years and have been found in harmony with short and long term carrying capacities of the local ecosystems (Lalonde 2005). The application of IK and Modern methods is exemplified in the sphere of soil preparation, pest and disease control, soil fertility, weed control, harvest and storage.

2.6. AIKS and Gender

Agricultural productivity increases by as much as 20 per cent when women are given the same inputs as men thus increasing women's human capital is central to poverty reduction (IFPRI 2002). Additionally, increasing women's control over assets raises investments in the next generation, especially, the girls' health (*ibid.*). Women play important roles in food security as food producers, keepers of traditional knowledge, preservers of biodiversity, food processors and food providers for their families (Kabeer 1990). The ESA working papers of FAO (2012) report that women make essential contributions to the agricultural and rural economies in all developing countries. Their roles vary considerably between and within regions and are changing rapidly in many parts of the world, where economic and social forces are transforming the agricultural sector. Rural women often manage complex households and pursue multiple livelihood strategies. Their activities typically include producing agricultural crops, tending animals, processing and preparing food, working for wages in agricultural or other rural enterprises, collecting fuel and water, engaging in trade and marketing, caring for family members and maintaining their homes (Liru 2014). Many of these activities are not defined as "economically active employment" in national accounts though they are essential to the well-being of rural households.

Indigenous knowledge is not usually gender neutral (IK notes 2004). IK in many cultures is the preserve of women, who conserve prescriptions and understandings, stories and botanical insights from the reservoir of oral traditions and historical experience, even where these are characterised by male-dominated culture (Mkapa 2004). Women in most societies of the world, as mothers, wives, grandmothers, daughters or sisters often represent the first line of health care, prepare meals for the family, convey values and provide the first role models for behaviour (Byaruhanga and Opedum 2008). In many rural societies of developing countries, women carry the burden of farm labour and farm transport; they arrange for household energy and water. During periods of hunger, women know which plants can provide emergency meals to help keep their families alive (Injamu 2014).

In their role as principal providers of food in the event of food shortages, women have developed coping strategies to maintain food security at the household level (Liru 2014). They often rely on minor crops or semi domesticated plants, more tolerant to droughts and pests, providing a reserve for extended periods of economic hardship. Many of the plants women use also have medicinal value (*ibid.*). However, women's indigenous post-harvest technologies, such as storage, and processing practices related to underutilised plants, are in danger of disappearing. Today, projects focusing on the conservation and sustainable use of medicinal plants increasingly collaborate with women on in-situ and ex-situ conservation efforts, such as the cultivation of medicinal plants in home gardens.

The role of women's IK in relation to farm animals is also underestimated. Although animal ownership in most societies is associated with men, women often collect fodder for cattle, look after their health, milk them, and collect and use dry cow dung for energy purposes (IK notes 2014). As a result, gender differentiated research in this area is beginning to discover that women have acquired a substantial stock of husbandry and ethno-veterinary knowledge that complements existing scientific knowledge. Women as bearers of indigenous knowledge, can probably act better than men act as bridge builders between representatives of the various knowledge systems (IK notes 2004).

Another aspect of Indigenous Knowledge is that it is expressed in language and usually an indigenous language- the mother tongue – of the inhabitants of the locality. Part of IK lies in, or at least supported by, the medium of language itself. Localised African systems developed over a long period and whose patterns are based upon local knowledge systems are expressed and passed on in local languages. Are these languages simply neutral media? Are they just instrumental vehicles for the expression of local knowledge and daily

life? Or do the languages play some role, by their very structure and usage in what is thought and known? The notion that language does not just express thought, but also shapes or influences it to some extent is true. If language influences thought and expression, it is shaped in turn by patterns of usage- the roles people play in employing it and the ends which to put it. Any African language is complete in itself to express one's thoughts and assimilate new ideas (innovations) and concepts no less dynamically than English.

3. Methodology

This study was carried out in the Kakamega County in Western Kenya. Kakamega County is situated between latitude 0017'18" north and 34045'19" east and with an altitude of 1250–1700ma.s.l covering an area of 1395km². It has a population of 1,660,650 (KNBS 2010), of which 52 per cent of them are women. It receives an average rainfall range of 1250 mm to 1750 mm annually with temperatures averaging at 22.5⁰ C. The main economic activity is agriculture with large-scale sugar cane farming, commercial maize cultivation and livestock keeping practiced. There is also subsistence farming where crops like potatoes, cassava, bananas and poultry rearing are practiced. Kakamega County was purposively sampled following the Economic Survey of Kenya that ranked Kakamega County as the poorest in the country with a poverty index of 49.2 per cent, contributing 4.8 per cent to the national poverty index (RoK 2014) with 57 per cent of its population living below the poverty line.

There are nine constituencies in the county two of which, Mumias and Ikolomani, were purposively sampled for this study since Mumias is predominantly a commercial sugar cane growing zone while in Ikolomani mainly subsistence small scale farming takes precedence. Besides, Ikolomani was sampled as the poorest constituency in the country (RoK 2014). Poverty levels in the county stand at 52 per cent (KNBS 2010). The main cause of poverty in County is a combination of many factors including low productivity in the agricultural sector due to retrogressive methods of farming and high cost of farm inputs, poor management of cooperative societies, poor marketing systems, poor infrastructure, indulgence in illicit brew, indolence, limited access to credit, insecurity, poor adoption of technologies and high cost of production among others (GoK 2008).

This study employed qualitative and quantitative methods where both primary and secondary data were used. The qualitative approach was chosen because of its potential to capture fluidity, beliefs, knowledge and attitudes that define human relations. This was made possible through in depth interviews with key informants from Agricultural Society of Kenya (ASK), One Acre Fund (OAF), Kenya Agricultural Research Institute (KARI), Small Micro Enterprises and the Western

Region Churches Community Services (WRCCS) and Focus Group Discussions with the respondents from the sample. In total, there were five FGDs, two in Ikolomani and two in Mumias, which were gender specific with one for men only and the other for women only in both sites. This segregation was deliberately adopted to ensure that each group would be free to share its experiences and opinions on food insecurity, gender and language. The fifth FGD was composed of both genders with two key informants from each group. The quantitative information collected has been tabulated to show the socio-economic background of the informants, gender dynamics in availability, accessibility and utilisation of agricultural resources, gender roles in agricultural productivity, the IK knowledge level, and the role of language in enhancing agricultural productivity.

The study used Rapid Appraisal of Agricultural Knowledge Systems (RAAKS) methodology which describes the status of AKIS and facilitates agricultural innovation by focussing on the social organisation of innovation (Engel 1997). RAAKS has three distinct phases:

1. Defining the problem situation with the concerned actors in an interactive way and identifying the diverse system actors who have important stakes in the innovation process.
2. Detailed study of the linkages and communication between the system actors knowledge networks, coordination and the broader environment in which the innovation takes place.
3. Feedback session for stakeholders to validate the findings and reach consensus on them, design joint action to enhance the innovation process in order to overcome constraints caused by weak or lacking linkages and communication and limited sharing of knowledge and resources among the actors.

As a beneficiary of WRCCS, I visited their stand at the annual exhibition of the Agricultural Society of Kenya (ASK) at Kakamega town to get a glimpse of the latest information on their products. The CEO invited me to join him at a stakeholders meeting on food security in Kakamega County. This gave me an ample opportunity to network and strike rapport with other delegates at the meeting. We all realised that though Kakamega County is endowed with favourable climatic conditions and black cotton soils, food insecurity and hunger persisted. After the meeting, I resolved to delve into the linkages between the system actors, knowledge networks, coordination and the social, political, economic and physical environment in which farmers' innovations thrive and how information reached the small scale farmers. It was easy to get the information that I needed because we belonged to the same team. After two months, a second stakeholder meeting was called at the

County government on which I presented my findings to validate them. We then reached a consensus and jointly planned how to enhance food security in Kakamega County. We went further to suggest a monitoring and evaluation framework for the recommendations that we had made for effective implementation. This chapter presents these findings, conclusions, recommendations and a logical framework for its implementation.

A well formulated problem situation that constraints innovation processes serves as an entry point for a RAAKS. In this case, the entry point is the persistent food insecurity in Kakamega County. This methodology is best used when diverse actors are involved in the action research and a well-trained facilitator carefully handles the interactive process. The various actors' include education institutions (Masinde Muliro University of Science and Technology, Bukura Agricultural Institute), Researchers (Kenya Agricultural Research Institute— KARI Kakamega), Private Sector (NGOs like One Acre Fund, WRCCS), Extension Services (Ministry of Agriculture, and Agricultural Society of Kenya). This study was pegged on grassroots innovation systems aimed at empowering local communities with the integrated knowledge in Agriculture for sustainable food security in the context of climate change. Farmers are under the threat of food insecurity partly due to environment, lack of farm inputs, poverty of ideas, lack of government support, lack of information and knowledge from research (Hall 2006).

AKIS purpose is to strengthen communication and knowledge delivery services to rural people. The overriding principle is to access agricultural knowledge through interactive learning by motivating women with indigenous agricultural knowledge to interact freely with agricultural extension officers, NGOs promoting food security, research institutions on agricultural production and policy actors to share indigenous and modern technology information on enhancing food security to reach a consensus over the issue. The Ministry of Agriculture is expected to provide an enabling environment and framework that will make this venture possible and reinforce communication among the actors.

4. Findings and Discussion

4.1. African Indigenous Knowledge Systems

The first research question sought to establish the farmers' AIKS) base and gaps. This was very important in this study because it formed the basis of the research. Their responses are presented in Figure 2.

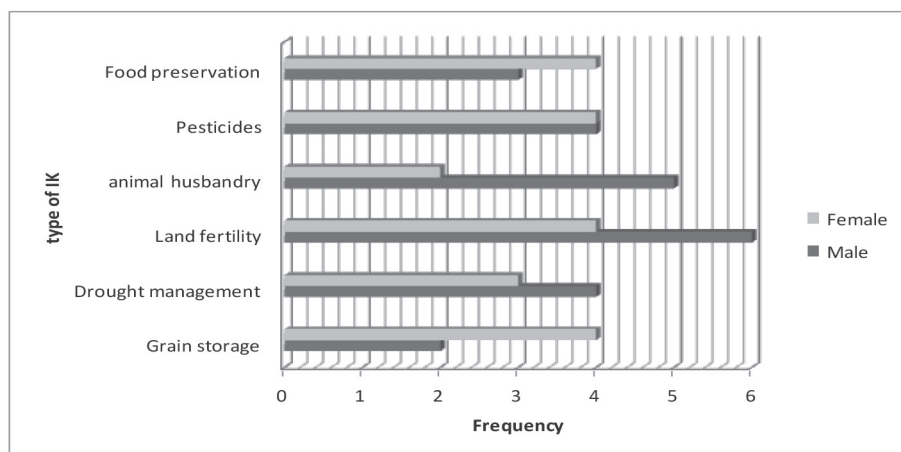


Figure 2. AIKS Information of Respondents (N= 46)

SOURCE: Field Computation

The information collected revealed that the highest percentage of farmers had indigenous knowledge on land fertility (22 per cent), animal husbandry (15 per cent) and pesticides (17 per cent). The results also revealed gender differences in knowledge base and gaps of the IK. Women had more knowledge on grain storage (66 per cent), food preservation (57 per cent) and pesticides (50 per cent) while men demonstrated more indigenous knowledge in animal husbandry (71 per cent), land fertility (60 per cent), and drought management (57 per cent). This finding resonates with Byaruhanga and Odepun 2008; Alamu 2004, who assert that both men and women have AIKS but the knowledge base and gaps differ. This could be attributed to the gender roles and power dynamics in food systems where women provide food for their families and are adapted to various environmental conditions for survival. This motivates them to seek more indigenous agricultural knowledge in particular areas like food preservation and grain storage to ensure food security for their families. Additionally, it was observed that the farmers were also knowledgeable about seed selection and storage as:

The farmers select seeds which were of good health and size. The seeds were then placed in baskets and hanged in kitchen ceilings so that smoke and heat would dry and preserve them. A significant number of farmers sprinkle ash on the grains to prevent weevils from attacking. The grain crops after harvest were stored in ventilated granaries and placed on top of twigs and leaves of plants such as Lantana Camara plant to prevent attacks by weevils.(FGD Respondent: Mumias)

Farmers also provided additional information in relation to AIKS. They indicated that they also had modern scientific knowledge of crop rotation, farm machinery and new crop varieties. However, farmers decried the lack of knowledge on improved farming methods and attributed this to inadequate extension services. They also lacked knowledge on alternative sources of information on improved seed varieties, relatively cheaper farm inputs and also where to market their farm produce. Due to the vacuum in information provision, unscrupulous middle men took advantage of the farmers and either sold them bad seeds or bought their produce at throw away prices. This finding echoes similar findings by Ali-Olubandwa, Kathuri and Wesonga (2011) and Opondo *et al.* (2009) who claimed that AKIS is compartmentalised, beauracritised and control-oriented. It means that communicating AKIS and AIKS still remains a challenge. In addition to this, the available information does not easily reach the target audience.

It was noted, from probing, that there was no correlation between respondents' level of education and their indigenous knowledge. In most cases those who possessed good AIK were illiterate. The level of education may however, determine success in integrating AIK with modern farming technologies. This will require farmers to have some basic literacy skills to understand the new innovation. It was observed that majority of respondents had secondary education with no formal employment, therefore resorting to small-scale farming as a source of livelihood.

4.2. Partnerships among Actors in Agricultural Knowledge and Innovation Systems in Kakamega County

4.2.1. Actors Involved in AKIS

Agricultural production in Kakamega County has attracted several institutions and organisations whose main objective is to improve farming conditions and efficiency through various interventions that are aimed at reducing food insecurity. Table 1 shows some of the institutions involved and their functions.

Table 1. Institutions involved in AKIS and their functions in Kakamega County

Institution	Function/Input
Ministry of Agriculture, Livestock and Fisheries Development	Policy implementation, capacity building, improvement in agricultural enterprise and extension services
KARI	Research and on-farm demonstration
OAF	Farm inputs loaning and demonstration
ASK	Demonstration
	Community mobilisation, farm input subsidies and on farm demonstration
WRCCS)	Extension services, capacity building and indigenous knowledge preservation and application

SOURCE: Field notes)

a) Research Institutes: The Kenya Agricultural Research Institute

KARI was established through the Science and Technology Act (Cap 250) of 1979 with the core mandate to conducting, co-ordinating and co-operating with various stakeholders in the promotion of Agricultural research and development activities countywide (KARI 2005; 2009). The institute's main focus is to strengthen Kenya's food security and income. KARI provides an institutional framework that effectively manages and strengthens the government's agricultural research system. KARI Kakamega was established in 1953 as a seed farm centre and later became one of the main centres in the country. The centre conducts adaptive, strategic and applied research using Farmers Systems Approach, Extension and Training. The centre generates and promotes information and technologies that respond to client demands under different socio-economic circumstances. This is usually achieved through collaboration with other stakeholders involved in agricultural research for development such as the Ministry of Agriculture, livestock and Fisheries Development, NGOs, Community-Based Organisations, County Administration, Banks, regional and international research organisations and donor agencies.

A respondent in one of the FGDs, had to observe KARI as:

KARI has been very helpful to us. I get my agricultural advice from them whenever I want to venture into anything on my farm. They have improved our crops to some extent and now we have better produce from our potatoes, beans, cassava and bananas. This has definitely improved our food levels. They even have improved

fodder like nappier, boma rods and lucern. (Muhonjia, respondent; Ikolomani).

The above observation attests to KARI's core mandate of conducting, co-ordinating and co-operating with various stakeholders in the promotion of Agricultural research and development activities countywide. The aspect of incorporation of Indigenous Knowledge and research is however low, though the institute has training centre specifically for IK. An official from KARI had this to say:

We hardly get people with IK coming to share with us what they know. If they came, we would give them audience and we would take the necessary steps in testing the innovation and if it is viable we would encourage farmers to use it. KARI and the Ministry of Agriculture have established a Farmers Training Centre for Indigenous knowledge at Kakamega. Farmers usually converge and are taught how to apply AIK in their farming activities. Farmers learn various uses of this indigenous technology including use of animal and compost manure, sprinkling of hot pepper on vegetables to control pests, drying of selected seeds for planting, alternating of livestock and crops on a field portion to restore fertility and soaking of seeds before planting in water to hasten germination among other practices. (Omondi; Official KARI).

One respondent had to criticise KARI as "Research institutes tell us the type of seeds we should plant but still some crops fail. I think the answer here would be upgrading our traditional seeds like maize varieties that withstood attacks from pests and they didn't need a lot of fertilizer". (Asman: respondent Mumias).

The above statement shows the prevalence of a disconnect among the actors in the agricultural production in Kakamega county. AKIS purpose is to strengthen communication and knowledge delivery services to rural people though the channels of communication are not clearly defined. One way to solve this impasse would be to use the administration machinery i.e. the chiefs, the village barasas to educate the rural farmers on the new technologies and offer solutions where this technologies fail. Incorporating the traditional knowledge would also go a long way in improving the agricultural production. Another area that both the scientific and indigenous knowledge would be beneficial to a larger population would be through broadcasts on the local FM stations in vernacular languages to fulfil the three distinct phases of RAAKS. There is lack of integration between the national policies and implementation mechanism at the local level (CIDA 2010).

b) Private Sector: One Acre Fund (OAF)

The organisation provides smallholder farmers with tools and financing to reduce hunger and poverty. It uses a market based

approach that facilitates transactions at various levels of the farming value chain, including seed sourcing and market support. One respondent in the FGDs had this to say about OAF.

OAF gives loans to farmers in form of farm inputs (fertiliser, seeds and advice). This is good; my farm harvest has really improved and I don't strain paying back the loan. Pauline; respondent FGD Mumias)

Concerns were however raised on the policies of OAF. Women find it difficult to access agricultural finance from the fund as asserted below:

Everything in the home belongs to the husband and we must seek permission to do anything on the farm. Before we get loans, we must seek approval because if he refuses then the organisation cannot give the loan. The husband is our main guarantor (Naomi: respondent FGD Mumias).

An official of the organisation had this to say:

I think our programmes are noble, we are looking into better ways of involving the men folk since most of our clients are women and the men at times cause some challenges. We cannot change our policy currently since we are also concerned with the risk management. (OAF)

Another concern that deters likely beneficiaries is the stringent conditions that the fund demands once they have given a loan. This is echoed by one respondent:

It is not practical to tell me to plant maize and wait until harvest without roasting any. Do you expect my children to steal from other farms? They (OAF) also told us to plant sorghum and millet which we rarely eat and there is no market for it at all. Our main food is maize meal (Tande: respondent FGD Mumias).

The scenario above shows that OAF took the EU SCAR 2012 model where the goal was to increase the productivity of the agricultural sector, by making farmers more professional through provision of farm inputs. However, this model might not have much success since according to Aluma (2004), capacity enhancement (CE) should not assume a vacuum of knowledge, skills and efforts without the opportunity to apply that CE in a local context are likely to be ineffective. He further asserts that adults learn best when knowledge and skills gained are of direct relevance to the problems they are seeking to solve. It is important that OAF includes the main stakeholders; the farmers, in their planning sessions, educate them and make them part of the innovation to get better results. To achieve this, again one of the most effective channels would be the local vernacular FM stations.

Private Sector: Western Region Christian Community Services

This is an organisation ran by the Anglican Church of Kenya that sponsors entrepreneurial activities of its church members through sourcing loans and capacity building in agricultural activities. The group mainly draws its membership from church groupings like the Mothers Union and the Youth League. From my research, the following sentiments were expressed:

We have learnt a lot from the church organisation. We as mothers have been able to rear chicken, sheep and cattle from the teachings we get from them. They even have improved cooking stoves that can be used as brooders for our chicks which in turn increase our chicken which we sell to buy sheep and eventually a cow. The waste from the animals is also very important because it has enriched our kitchen gardens that we rarely lack vegetable at any time of the year. They also give us soft loans to invest in green houses where we plant tomatoes mainly for the local market. This is mainly a mothers' affair though men are welcome but most of them show little interest unless it is time to sell. (FGD respondent Mumias)

An official of the organisation had this to say during the interview:

We need funding and close partnership with the county government to scale up our programmes since we blend IK and MTK to ensure sustainability in food security.

c) Policy Makers: The Kakamega County Government and the Ministry of Agriculture

The county government has a ministry of Agriculture that is oversees all agricultural activities in the county and lead in the fight against food insecurity. An official in the ministry had this to say on the current situation in the County:

I am perturbed with the current food insecurity situation in Kakamega County despite our rich agricultural endowment. Our devolved government is committed to eradication of hunger and food insecurity and creating inclusive development. We are bringing on board all stakeholders to discuss home grown solutions. A partnership with the national and international donors, the academia and entrepreneurs is high on our agenda.

IK can be integrated into the curriculum of our education system since agriculture is our mainstay. In as much as we want Kenya to meet its vision 2030 target of being a middle class economy, this might prove a mirage if the citizens are hungry. Food security should be integrated in the curriculum from as low as the nursery level in nursery rhymes. It should teach the learners the best practice traditional knowledge on food security.(In-depth: County official)

The government through the administration machinery has identified very poor households that are food insecure. We give them food subsidies but this is not adequate. The best approach we are pursuing is a partnership with all stakeholders to educate the masses on ways of sustaining food security. We want to get our youth involved in profitable agricultural activities, encourage the education sector to develop a critical mass of person with knowledge of food security, support and partner with NGOs that are encouraging IK inclusion. (In-depth Interview: Ministry of agriculture officer).

However, a respondent had a different view of the county government:

We incur losses since we never get the government subsidies like fertilisers and pest control services. Most of the subsidies end up in retail shops repackaged and we pay dearly. (FGD respondent: Mumias).

d) Extension Services: The Agricultural Society of Kenya

The Agricultural Society of Kenya is a national body that show cases agricultural innovations, products and offers advice to farmers on best practices that have succeeded elsewhere. The society holds Agricultural fairs in various parts of the nation. Kakamega County has an annual ASK show in May. A respondent from ASK said:

Our events are annual therefore it is not easy to make a follow up of all our participants but still we can use the media to promote our agenda. We have found out that FM stations that use vernacular languages are the best in disseminating information. The government can fund such initiatives that will convey AKIS and IK to the wide listenership served by these stations. The mobile telephony can also be used through platforms like face book, twitter and sms. (In-depth interview; ASK official)

The above scenario echoes the (AKIS that pays attention to the policy environment, institutional framework for supporting the innovation conditions for expressing demand for innovation partnership and networking and finance systems for the innovation. Most research institutions play a great role in innovation but most of these do not reach the local farmers (Rivera, Qamar and Mwandemera2005). The private sector (NGOs) work with communities on the ground and yet their work are unrecognised and the all the organisations and government agencies seem to work in different direction, they lack coordination and thus their efforts are fragmented. In agreement with AKI (EU SCAR 2012), a demand for a radical political shift (Kakamega County) from strengthening research or extension institutions (KARI OAF) to strengthening linkages and communication that should take place among system actors. It sees the farmer not as a mere recipient of technology from

research via extension but as one of the stakeholders the process of generating, disseminating and using knowledge. The creativity of farmers needs to be stimulated and their innovations scaled up. The innovation needs to recognise managing livelihoods by way of communicating, organising, and accessing resources, rules of the game, routine practices, community agreements, legal frameworks and value systems. The farmer should use his/her own wisdom to experiment an indigenous and modern scientific knowledge, fuse the two to add value so that it becomes an innovation.

e) Education: Masinde Muliro University of Science and Technology and Bukura Agricultural Institute

The two institutes offer agriculture based courses, with Bukura offering degrees and diplomas in agricultural disciplines. Masinde Muliro University offers research facilities to researchers in the area disaster management in the field of agriculture. Agriculture was incorporated into the Kenyan education system as a compulsory subject at primary level but at the secondary school, it is an optional subject that attracts very few students due to their predisposed attitude. The content of the subject itself is very theoretical in nature and does not incorporate IK. The students are mainly taught about farm implements, mechanisation and the comparisons drawn are with the western world whose context is very different from the Kenyan one. With our youth taking no interest in agriculture, it poses a dangerous precedence and harbinger to food insecurity. Even in homes with the potential of profitable agricultural activities, the youths prefer going to the urban areas.

...we don't see why we should use a lot of energy on our farms when the prices of our produce are so low, yet the same is so expensive after being manufactured. The biggest problem we face is the issue of middle men; they buy from us during harvest time at ridiculous prices, they hoard the produce for some times then again determine a higher price to sell back to us, making a kill. (FGD respondent: Ikolomani).

4.3. Farmers' Agricultural Innovations

A third research question sought to find out farmers' agricultural innovations. This question was important in this study because one of the reasons for food insecurity in Kakamega County according to Liru (2014) was the top-down approaches on AKIS, ignoring farmers' knowledge and innovations. Their responses are presented in Figure 3.

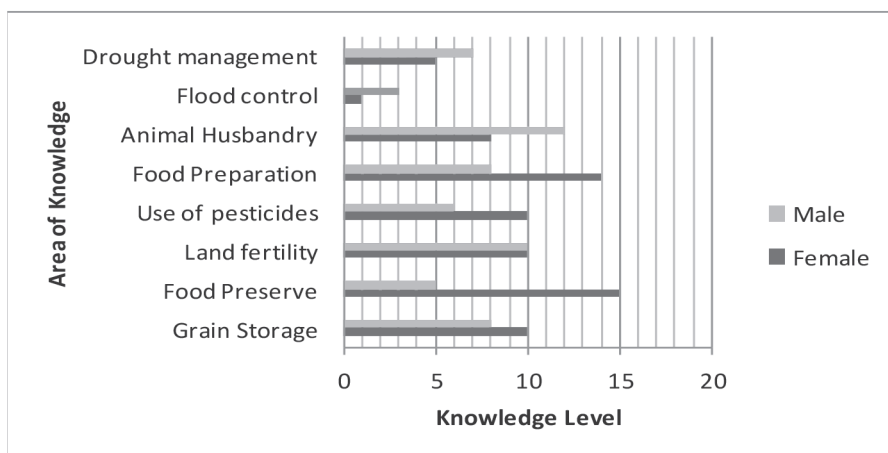


Figure 3. Farmers' Agricultural Innovations in Kakamega County by Gender, N=46

SOURCE: Field notes

The figure above shows that within Kakamega County, farmers have used innovative ways in dealing with many areas in agriculture. These areas include grain storage, food preservation, and land fertility, use of pesticides, food preservation, animal husbandry, flood control, and drought management. This aligns with several researchers, such as Chiwandamira and Mbengo (1999); Matowanyika, Garibaldi and Musimura (1995); Kunnie (2000) and Aluma (2004). However, the knowledge levels differ by gender. This confirms what Kabeer (1990) and FAO (2012) found out. Furthermore, most of the knowledge is a preserve of women including food preservation, the use of pesticides, food preparation and grain storage. Men seem to be smarter in issues of flood control, animal husbandry and drought control. This finding also further confirms the FAO (2012) and Beyene and Nemara (2014) assertion that food systems are controlled by gender power relations whereby women are more involved in food production while the men control food consumption and distribution. Major decisions regarding food at the household and community level are made by men. The above responses were triangulated with responses from focus group discussions. Some of the excerpts are presented below:

.....my mother had a way of storing cereals that would be preserved for a very long time. She would use ash from burnt sisal fibres to dust the cereals. Another method was to use burnt bean leaves ash as a preservative and as an ingredient in our foods. Rarely did our cereals come under attack from weevils or other pests, nowadays we use pesticides but within a month all the grains have been destroyed by

pests. I believe if we used that knowledge our mothers had, we would be far better off.

.....we never lacked vegetables in our home or the community. Most vegetables-murere, miroo, lisutsa, lisebebe- were medicinal and each household at least planted some. Vegetables were never for sale but for communal sharing. These vegetables were never affected by diseases easily and all year round we had vegetables for each season. These days the only vegetable you find is sukuma and cabbages which cannot withstand drought and it easily attacked by diseases. We should find a technology that can sustain our traditional vegetables.

Additionally, women respondents indicated that the gender discrimination in food consumption made them lack sufficient nutrients in their bodies. They were undernourished because of cultural taboos and practices.

..... Men used to dictate what we eat. They actually took the best foods which women had prepared and used cultural taboos as a hindrance for us to eat. We were not allowed to eat chicken; beef had to be smoked before we touched it and many other things. Education has enlightened us so much and we have ignored those taboos and I believe we are healthier. The restriction to eat some foods was embedded in our folklore, our songs and even in the day to day conversations.

This excerpt indicates that due to education, research and awareness, women have realised food security.

4.4. Communicating AKIS

Farmers were asked how information about new improved methods that can boost their production was relayed to them. The findings were presented in Figure 4.

The findings reveal one main source of information is the vernacular radio station for the female respondents while the male preferred getting information from the village meetings (barasas). The national radio is also mentioned as a tool of passing information beneficial to both genders while men again were able to use newspapers as a channel. This could be due to literacy levels of the population in Kakamega County. It could also be because, the reproductive roles of women dictated by culture do not give them time to get out of home and attend to village gatherings like men. The men may not be allowing their wives to attend to the meetings too. The low response reflected on television indicates that either very few respondents own televisions due to the high poverty levels or agricultural information programmes are not aired on television.

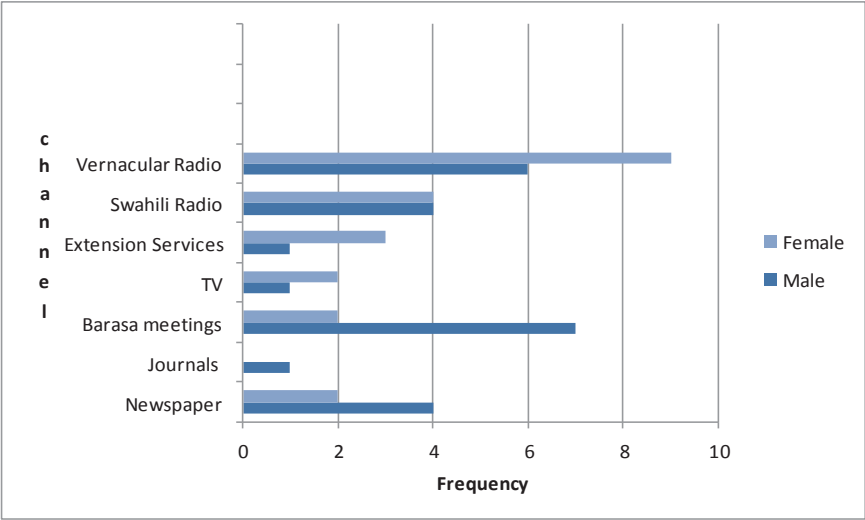


Figure 4. Channels of Relaying AIKS Information to Farmers (No = 46)
SOURCE: Field notes

4.5. Integration of IK and Modern Scientific Knowledge

The respondents were asked how they integrated their traditional knowledge with modern knowledge and the data presented in Figure 5 was generated.

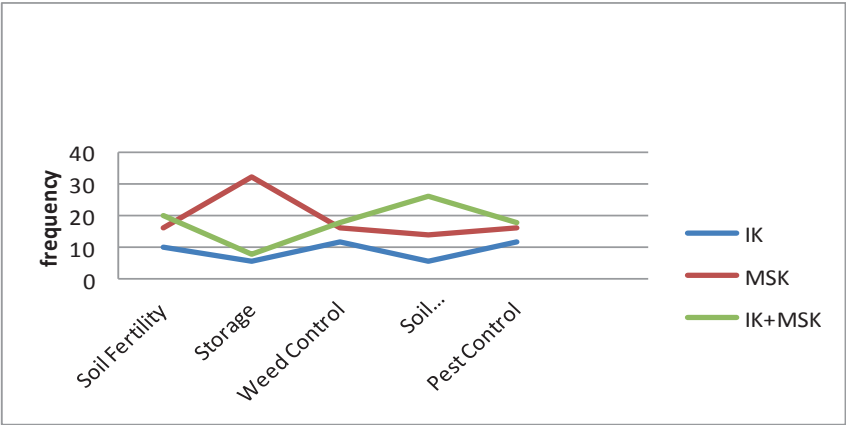


Figure 5. Integration of IK and MST in Kakamega County, N= 46
SOURCE: Field Notes

Figure 5 shows how farmers have integrated their IK and MST to improve their yields. Most of them acknowledged that when they

combined the two methods, they yielded better results. Having gathered information on AIKS and AKIS in this study, I sought to know how best this knowledge can be integrated and documented for further reference. Various actors responded. Excerpts from their responses were as follows:

...I suggest that we document the indigenous knowledge on food systems as a way of preserving our culture. Future generations will learn from it. Write books and take photographs and videos then keep them as our heritage (Farmer Asmani).

...We have a lot of research that has been done on seed varieties in relation to climate change and physical environment of a place. KARI shares this information with those farmers who are interested in it. We are yet to consider the idea of synchronising the indigenous and modern scientific agricultural knowledge. Maybe the universities can do that and include it into the curriculum (KARI officer).

...Universities and other academia is working very hard to disseminate our research information and turn it into knowledge. In MMUST, we already have a radio station. With proper plans, we can use the radio station for knowledge dissemination. Mulembe FM is also very popular here. All stakeholders can be brought on board to air their views on a specific programme, dubbed 'food security in Kakamega County. It is true that integration or partnership is the only way to go. (Prof. Otieno).

...I support the idea of integrating IK into modern scientific technology and mainstreaming it into our basic curriculum. It is ironical to say that agriculture is our mainstay in Kenya yet 'Agriculture' is an optional subject in secondary school. In fact, it attracts the least number of students. The agriculture laboratories in most schools are the poorest equipped. In Bukura Agricultural Institute and other institutes like it, the laboratories and farm equipment are too old. This does not motivate students to take the subject. (Ms. Nambo, Lecturer at Bukura Agricultural Institute).

....For us at WCCRS, we already integrate IK and modern scientific technological knowledge in our programme with the farmers. I can testify that the mix is very good. The results are visible (WCCRS Field Officer).

...The Ministry of Agriculture is very keen on any farmer innovations for up-scaling. Recently, we visited Asian countries to learn from them how they use small holder farms to produce surplus food for sale. We learnt that they integrate IK and modern scientific technology to ensure food security. We are on course with this but we have financial constraints to start the pilot project. (Mr. Amwayi, MOA-Kakamega).

These responses indicate that all the actors involved in Agricultural Knowledge Innovation Systems agree that the knowledge is important and should be documented, integrated to add value to it, which in turn will lead to food security. They suggest agriculture to be integrated into the basic curriculum as a subject. They also propose that media can be used to create awareness of this hybrid knowledge. They further agree that Asian countries have adopted the hybridisation of IK and modern scientific technology in agriculture for food security. This was cited as a best practice that can be emulated.

4.6. Agricultural Land Ownership: Gender-Power Dynamics in Food Security

We sought to find out the agricultural land ownership by residents of Kakamega County. Land utilisation is a crucial factor in food security because it one of the preconditions The findings are presented in Figure 6.

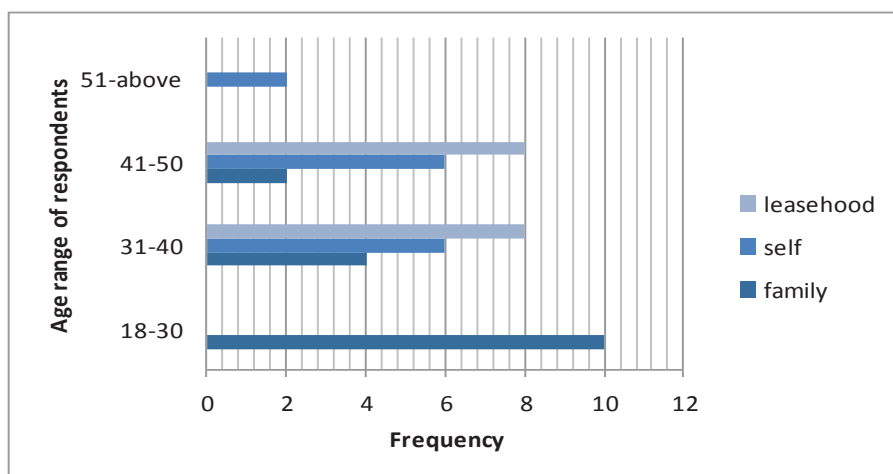


Figure 6. Agricultural Land Utilisation by Respondents, N=46

SOURCE: Field notes and computation

Figure 6 shows agricultural land ownership of the respondents by age group. Most of the land is under the family 39.1 per cent, leasehold holds 34.8 per cent while individuals control 30.4 per cent. This has implications for food security because of household decisions on farming and land use. A wrong decision by the head of the household may lead to food insecurity and hunger for that particular household. Leasing land means the farmers may lose part of their profits accrued to land owners in terms of rent. In most cases, they may be forced to sell part of the food so that they can pay the land owners.

The age set cohort of 18–30 is mainly supported by family land, leasing of land is prevalent in the age set 41–50 where it accounts for 50 per cent and the 31–40 cohort where 44 per cent have leased out land while 22 per cent still depend on family land, only 34 per cent have control over their land. It is noteworthy to realise that the land under utilisation by the respondents is only 65.2 per cent while the rest is leased. The above scenario could be explained from various angles. For instance, in Mumias, where sugar cane is the main crop, the inhabitants have leased out their farms (for periods ranging from two to twelve years) since the crop takes too long to mature against their immediate needs to be achieved. During the lease-hood period, short term crops that would ensure household food security are not grown resulting in an overdependence on market goods. Secondly, land in the Luhya culture is controlled by the male and all decisions on the utilisation including the type of plant or even its disposal are masculine. Where most of the land has been leased, little is left for subsistence farming and the family is vulnerable to food insecurity. In such situations, the household head, usually the man will migrate to urban areas to fend for himself leaving behind the wife and children who must find ways of survival. In most cases, the women end up working on their leased farms for meagre wages.

During the FGD session a question on land utilisation and control elicited the following reactions:

I own the land because my father and my grandfather handed it down to me, I make all decisions on my land and I don't need to consult my wife on what to do with it. The land is mine just as my wife is mine. If I decide to sell it or lease it, no one including her can stop me. (Respondent from Mumias)

His sentiments are echoed by a respondent in Ikolomani:

The issue of land ownership and utilisation is strictly a man's duty; we can only allow issues like what to be planted in the kitchen garden be controlled by women.

The two examples above point to the patriarchal belief that is gender-biased. Land is owned by men and all decisions are controlled from a masculine point of view irrespective of the consequences of the decision. This is aptly captured by the language of exclusion I used in the above extract. The respondent from Mumias uses the pronoun "I" four times, 'my' and 'mine' seven times while the respondent in Ikolomani seeks solidarity in masculinity by saying a man's duty. Here, therefore, language has bestowed the man exclusive rights to ownership and decision-making which in turn has marginalised women.

There is a communication breakdown that the women folk know what is ideal but can't share the information with the men because of

cultural implications associated with control food production. Various reasons are given for leasing and selling land including emergencies, sickness, funerals, school fees, hospital bills, family parties, memorial services that eventually increase food insecurity. Furthermore, Feminisation of agriculture is an adaptive strategy since men leave women to work on the farms as they go to urban areas to find jobs that are well paying. Usually, they end up with casual jobs that pay very little, thus their remittances are not adequate neither to take care of themselves nor purchase farm inputs thus increasing the risk of food insecurity.

4.7. Challenges Facing Innovative farmers

With regard to challenges that farmers face in their efforts to become innovative, the following themes emerged:

- i. Lack of appreciation by outsiders of farmers' knowledge and values.
‘.... It is believed that we do not know anything because we are not educated have no certificates so it is researchers who know it all. They come here to tell us what to do on our own farms yet some of their new ideas fail here completely. When we use fertilisers, our lands are less productive as compared to when we use manure.
- ii. Insufficient opportunity for farmers to decide on the scientific technology proposed to them. When the Agriculture people come they do not ask us what we know.
‘...In the village baraza we are told what to do to improve our farm yields, milk production of our farms or pest control. They do not give us time to do our own research or air our own research or air our views. It is like you must do the way we tell you and no other way.’
- iii. Lack of financial support to encourage local innovation
‘... I have never heard that money has been allocated to us rural farmers to share the knowledge we have of IK with others. Never, resources are given to research institutions, banks or micro-finance institutions.
- iv. Participatory learning process
‘...Maybe the problem is more with how and what knowledge should be transferred and shared, I have not heard a program by our government through the chiefs or MCAs promoting dialogue on training, maybe they are still planning.

5. Conclusion and Recommendations

5.1. Conclusion

The purpose of this chapter was to examine food insecurity in Kakamega County using the Agricultural Knowledge Innovation Systems. This subject is clearly an historical one and is very timely to inform Kenya on the progress made towards the Maputo Declaration and CAADP on food security. The interactions of actors and effective communication among them on Agricultural Knowledge and Innovation systems have been analysed. Several key issues have emerged from the discussions. These include:

- i. IK exists and it is passed on informally among the rural farmers. There is no formal mechanism of documenting it or preserving it for the next generation.
- ii. All stakeholders agree that IK is valuable and should be integrated into Agricultural Knowledge and Innovation Systems yet the fragmented implementation or lack of integration renders it obsolete.
- iii. Farmers' innovative ability is a reality and is widely used by rural farmers but it is hampered by top- down government policies.
- iv. Farmers choose to use either indigenous knowledge or scientific knowledge and technology or a hybrid of both depending on the context and their knowledge level.
- v. The school and college curriculum both formal and informal is critical in the integration of AKIS and AIKS. If children and the youth are exposed to agricultural knowledge early, they will internalise and institutionalise it. The curriculum should also be made appealing to attract the children, thus with better knowledge on agriculture food insecurity will be curbed.
- vi. ICT can play a vital role in the integration process. It can create awareness of AKIS and AIKS and the food systems. The local radio stations, especially FM stations that use indigenous languages can be used as focal points of disseminating AKIS and complementing the government's and stakeholders' efforts.
- vii. There is political will and multi -stakeholder concern on food insecurity which should be directed towards putting in place measures that can mitigate the adverse effects of climate change, poverty and food insecurity.
- viii. Incentives to farmers like subsidised fertilisers, seeds and other inputs should be channelled through a transparent way to reach the intended recipients since these would greatly boost the

interest of men and the youth. Lack of farm subsidies has feminised farming in Kakamega County resulting in acute food insecurity.

- ix. The government food programmes for poor households faces challenges in household targeting.
- x. This research has revealed that gender-power relations play a great role in food in (security), whereas women do more of the production, men are concerned with consumption and distribution. Cultural practices and beliefs like food taboos are a hindrance to food security and (Agro-microfinance) policies also are not gender-sensitive. Thus, Mainstreaming gender in AKIS is important for agricultural knowledge systems.

5.2. Recommendations for Policy-makers

Following the above stated conclusions, I hereby make the following recommendations:

- i. Create a receptive policy environment at local and national levels to appreciate and stimulate local innovation. The ASK exhibitions stand out as the best platforms for this.
- ii. Systematically identify, document and promote local farmer innovations in Kakamega County. Outstanding farmers should be recognised during the ASK shows and their innovations should be documented and up-scaled.
- iii. AKIS should take a bottom up- top down approach. In this chapter, I have proposed an approach that is multi-stakeholder to promote the hybridisation of IK and modern scientific technology for food security and sustainable development as an innovation in rural farmers living in Kakamega County, Kenya. I propose participatory appraisal research for research uptake so that various actors involved in innovative technology could interact.
- iv. Budget for up-scaling agricultural innovations research and exposure to relevant knowledge and technologies. Realising that food security is critical to sustainable development, the county government should allocate a substantial amount to it. This will partly solve the high rate of youth unemployment problem that the youth apportion blame to lack of subsidies and incentives in agriculture.

I recommend hybridisation of IK and modern scientific technology in agriculture. Various formats can be used to do this: integration into the basic curriculum as formal and informal hence revival of 4K Clubs in schools to promote agriculture, formation of youth clubs to do road- shows and displays of the integrated AKIS, encourage

specialisation in agriculture as a discipline in universities; designing a radio program that will be aired on Mulembe FM, a vernacular radio station that has a wider audience and Masinde Muliro radio, Partner with Kenya film cooperation to show documentary films on farmer innovations and new research information on agriculture, using social media to share both IK and modern scientific technology information on agricultural practices in the County. All actors in this program should participate: Institute webinars with all stakeholders to share any new information and encourage them to disseminate it widely, write about best practices and farmer innovations in academic journals, bulletins, the County News Magazine and posters. ASK show and County Education days should be dedicated to the food security theme. The guidelines for implementation of the hybridisation of AKIS and AIKS are as follows:

- a. Get started by striking rapport with different stakeholders discussing the partnership at the grassroots level: Knowledge experience and innovations available are identified at this level.
- b. Try out: Agricultural innovations are studied the environment in which they operate actors' factors facilitating or impeding food security characteristics of food security and the gender-power relations. This will help identify what is feasible and what is not feasible and trying out new.
- c. Design experiments: The stakeholders led by the rural farmers then decide on which technologies they want to try out. The farmers explain what they want to try out as researches support and simplify the innovation for quick uptake. The scientists help the researchers monitor their progress. Agricultural researchers and academicians conduct laboratory tests and share findings with rural farmers.
- d. The actors should synchronise their activities, as the researchers and academics are separated from the farmers (users) by now. The agricultural knowledge generation is compartmentalised bureaucratised and control oriented (Opondo *et al.* 2009).
- e. Sharing results: Facilitators help farmers to document the innovation research process.

I recommend the revision of the AKIS model by Hall (2006) and Rivera, Qamar and Mwandemera (2005) to make gender-power relations the pivotal point of food systems. As such, the AKIS actors revolve in a policy, social and physical environment controlled by gender- power relations of food production, consumption and commercialisation. Together with this, I critique their conceptual model that emphasises strengthening of communication of AKIS by proposing a new model that accommodates the 8 characteristics identified by them but add on ' how 'the integrated knowledge is

communicated so that the actors become aware of the foregoing. The proposed model is presented in Figure 7.

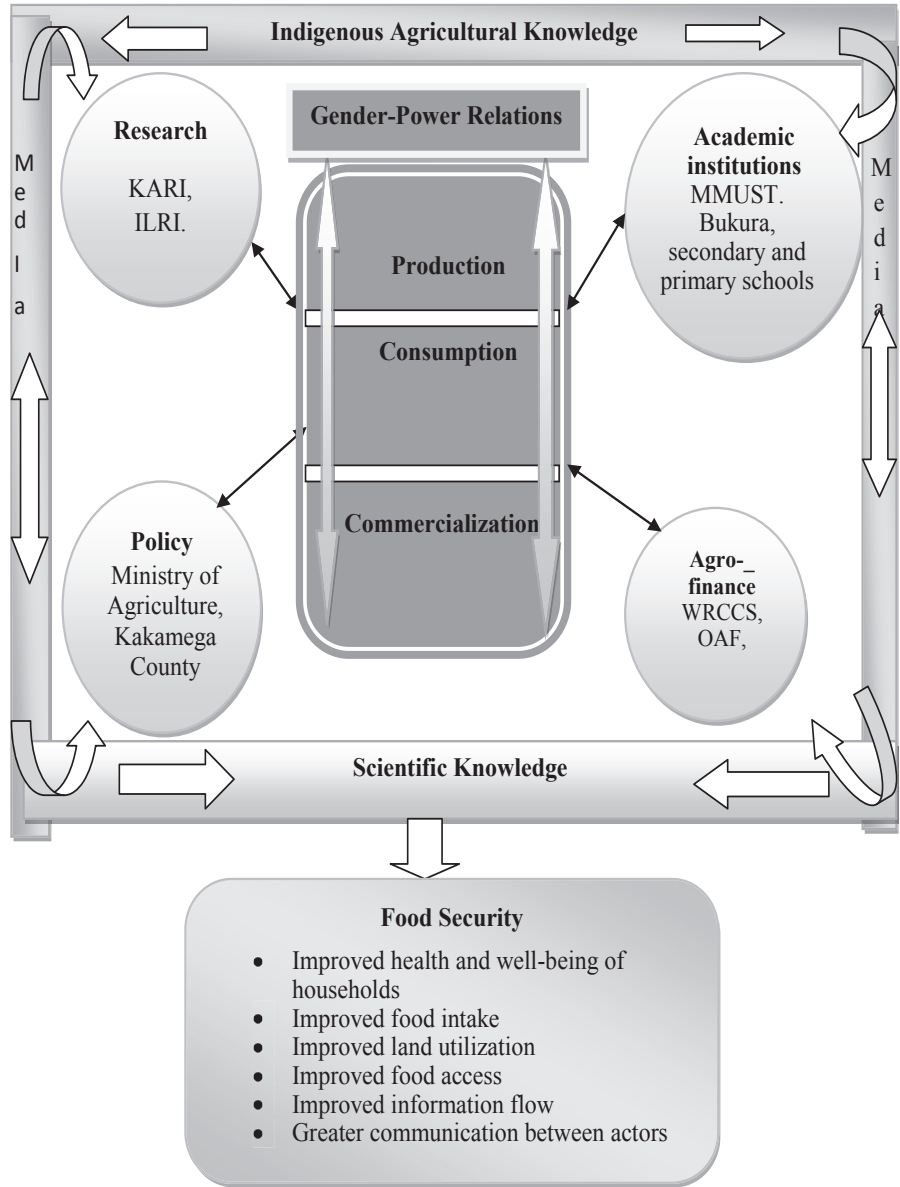


Figure 7. Framework for Integration of Agricultural Indigenous Knowledge and Modern Scientific Knowledge

SOURCE: Authors Own Conceptualisation

References

- Ali-Olubandwa, A.M., Kathuri, N.J., and Wesonga, E.O. 2011. Effective extension methods for increased food production in Kakamega District. *Journal of Agricultural Extension and Rural Development*, 3(5): 95–101.
- Aluma, J. 2004. Indigenous knowledge: Local pathways to global development: Marking five years of the World Bank Indigenous Knowledge for Development Program. Washington, D.C.: World Bank.
- Amanuel, A., Waters-Bayer, A., Fincham, R., Mudahara, M. 2009. Comparison frameworks for studying grassroots innovation: Agricultural knowledge and information systems. *In*: Sanginga, P. C., Bayer, A. W., S. Kaaria, Njuki, J. and Wettasinha, C. (Eds.), *Innovation Africa: Enriching farmers' livelihoods*. London; Earth Scan.
- Arend, E. 2011. *Gender IFIS and food security case study*. Washington D.C.: Kenya, Gender Action.
- Bergek, A., S. Jacobsson, M. Hekkert and K. Smith: Functionality of innovation systems as a rationale for and guide to innovation policy. 2010. *In*: R.E.H.M Smits, S. Kuhlmann and P. Shapira (Eds.), *The theory and practice of innovation policy. An international research handbook (PRIME Series on Research and Innovation Policy in Europe)*. Cheltenham (UK) and Northampton, MA (USA): Edward Elgar Publishing.
- Beyene, F and Nemera, Z. 2014. *Gender, agriculture and natural resources: A training manual*. Addis Ababa: OSSREA.
- Bodouroglo, C. and Alarcon, D. 2012. *Sustainable agricultural innovation systems (SAIS) for food security and environmental protection*. Geneva: UNRISD.
- Byaruhanga, Y.B., and Opedum, P. M. 2008. The impact of culture on food security in Uganda. *Global Knowledge, 1*: 52–59.
- Chambers, R. 1983. *Rural development: Putting the last first*. London and New York: Routledge.
- CIDA. 2010. *Increasing food security: CIDAS food security strategy*. Montreal, Canada: CIDA.
- Chiwandamira L, and Mbengo, I. 1999. Environmental management ZOU Module. Harare: ZOU.
- Cotula, L., Vermaalen, S., Leonard, R., and Keely, J. 2009. *Land grab or development opportunity? Agricultural investment and international land deals in Africa*. London/Rome: IIED, FAO/IFAD.
- Engel, P.G.H. 1997. *The social organization of innovation*. Amsterdam: Royal Tropical Institute.
- EU SCAR. 2012. Agricultural knowledge and innovation systems in transition—A reflection paper. Brussels.
- FAO. 2014. *The state of food and agriculture (SOFA): Innovation in family farming*. Rome: FAO.

- . 2012. *The state of food insecurity in the world 2012: Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition*. Rome: FAO.
- . 2009. *FAO and traditional knowledge: The linkages with sustainability, food security and climate change impacts*. Rome: FAO.
- . 2000. *The state of food and agriculture 2000*. Rome: FAO.
- FAO, IFAD and WFP. 2014. *The state of food insecurity in the world 2014. strengthening the enabling environment for food security and nutrition*. Rome: FAO.
- Fatma, O. I. 2009. The role of women in providing and improving household food security in Sudan: Implications for reducing hunger and malnutrition. *Journal of International Women's Studies*, 1(2): 144–169.
- Hall, A. 2006. Enhancing agricultural innovation: How to go beyond the strengthening of research systems. Washington, D.C.: World Bank.
- IK Notes. 2004. *Local pathways to global development; Marking five years of the World Bank indigenous knowledge for development program*. Washington, D.C.: World Bank.
- Injamu, R. S. M. 2014. Factors influencing rural women participation in agricultural food crop production in Kenya: The case of Matungu sub-county in Kakamega County. An unpublished thesis, University of Nairobi, Nairobi.
- IFPRI. 2002. 'Sustainable food security for all by 2020'. *Proceedings of an International Conference, September 4–6, 2001, Bonn, Germany*. Washington, D.C.: IFPRI.
- Kabeer, N. 1990. Women, household food security and coping strategies. *Nutrition Policy Discussion Paper*. Geneva: United Nations.
- Kassie, G.T., Langyanito, A., Erenstein, O., Maleni, D., Gwara, S. and Tsedeke, A. 2012. *Characterization of maize production in Southern Africa: synthesis of CIMMYT/DTMA household level farming system surveys in Angola, Malawi, Mozambique, Zambia and Zimbabwe*. Mexico: CIMMYT.
- . Drought risk and maize production in Southern Africa: *Journal of Asian Scientific Research*. retrieved on 20th March 2015 at <http://aesweb.com/journal-detail.php?id=5003>.
- Kenya Agricultural Research Institute (KARI). 2005. *Crop production handbook for wheat, oil crops and horticulture*. Kinyua, M.G and Ochieng, J.A.W. (Eds.), G. Gundsil Printers and stationery, Nairobi.
- Kenya National Bureau of Statistics (KNBS). 2010. *2009 Kenya population and housing census*, Ministry of Planning, National Development and Vision 2030. Nairobi: Government Press.
- Kimani- Murage, E.W., Holding, P.A., Fosto, J.C., Ezech, A.C., Madise, N.J., Kahurani, E.N. and Zulu, E.M. 2006. Food security and nutritional outcomes among urban poor orphans in Nairobi, Kenya: *Journal of Urban Health: Bulletin of New York Academy of Medicine*, Vol. 88, suppl. 2, New York.

- Klerkx, L., and Leeuwis, C. 2009. Shaping collective functions in privatized agricultural knowledge and information systems: The positioning and embedding of a network broker in the Dutch Dairy Sector. *The Journal of Agricultural Education and Extension*, 15(1): 81 – 105.
- Kunnie, J. 2005. 'Decolonizing the university: Utilizing an indigenous cultural framework to develop curricula in education to transform the African continental context'. Paper presented to the South African Society for Research and Development in Higher (SAARDHE) Conference. University of KwaZulu-Natal. 26–29 June 2005.
- . 2000. Developing indigenous knowledge systems and technological systems. *In* E.M. Chiwome, *et al.* (Eds). *Indigenous knowledge and technology in African and Diaspora communities: Multi-disciplinary approaches*. Harare: Southern African Association for Culture and Development, pp 33–44.
- Kyeyune, R. K., Agea, J.G., Lugangangwa, E. and Obua, J. 2012. Role of indigeneous knowledge in enhancing household food security: A case study of Mukungwe, Masaka District, Central Uganda. Makerere University, Kampala
- Lalonde, A. N. 2005. 'African indigenous knowledge and its relevance to sustainable development.' Retrieved on 4th April 2015. http://www.idrc.ca/en/ev-84408-201-1-DO_TOPIC.html Liru, P. N. 2014. The contribution of women towards food security in Malava constituency, Kakamega County. University of Nairobi. Matowanyika, J.Z.Z., Garibaldi, V., and Musimura, E, (Eds.). 1995. What are the issues on indigenous knowledge systems in southern Africa: Some issues of relevance linking indigenous systems to sustainable resource management in Southern Africa, Harare, IUCN, 51–61.
- Ministry of Agriculture. 2005. *Strategic plan for the Ministry of Agriculture (2005–2009)*. Nairobi, Kenya: Government Printers.
- Mkapa, B. 2004. Indigenous knowledge: Local pathways to global development: Marking five years of the World Bank indigenous knowledge for development program. Washington, D.C. World Bank.
- Mumbua, A.M. 2010. Women's indigenous knowledge in household food security in Mulili sub-location, Makindu District of Eastern Kenya. Unpublished thesis: UON, Nairobi.
- OECD . 2005: *Governance of Innovation Systems*, vol.1. Paris: OECD.
- Opondo, C., Almekinders, C., Momo, J., Kanzikwera, R., Birungi, P., Alum, W and Barmogeza, M. 2009. *Applying the innovation systems concept in the field: Experiences of a research team in Uganda*.
- Ponge, A. 2011. Integrating indigenous knowledge for food security: Perspectives from the Millennium Village Project at Bar-Sauri in Nyanza Province, Kenya. Paper presented to the African Research and Resource Forum (ARRF) and the Economic Policy Research Centre (EPRC) for International Conference on Enhancing Food Security in

- Eastern and Horn of Africa regions, A conference held in Kampala on 6–7, November 2011.
- Republic of Kenya. 2008. *Food security and nutrition strategy*. Nairobi: Government Printer.
- Rivera, W.M., and Zijp, W. 2002. *Contracting for agricultural extension. International case studies and emerging practices*. Washington D.C.: CABI Publishing.
- Rivera W. M, Qamar, M.K., Mwandemera, H. K., 2005. *Enhancing coordination among akis/rd actors: An analytical and comparative review of country studies on agricultural knowledge and information systems for rural development (akis/rd)*. Rome: FAO.
- Röling, N. G., and Engel, P. G. H. 1991. IT from a knowledge system perspective: Concepts and issues. *In*: Kuiper, D. and Roling, N.G.(Eds.), *The edited proceedings of the European Seminar on Knowledge Management and Information Technology, Wageningen*. Wageningen: Agriculture University 8–20.
- Sanginga, P.C., Bayer, A.W., Kaaria, S., Njuki, J. and Wettasinha, C. 2009. *Innovation Africa: Enriching farmers' livelihoods*. London: Earth Scan.
- Tesfaye, T. 2003. Agricultural growth and poverty reduction: Empirical evidence, lessons and conditions for effectiveness. Draft paper submitted to the Research Department of the African Development Bank, Abidjan.
- Tesfaye, T. and Degefa, T. 2009. Linkages between water supply and sanitation and food security in four study communities in East Hararghe zone, Oromia region. *Ethiopian Journal of Development Research*, 3(1): 63–92.
- Tesfahun, F., and Amanuel, A. 2003. Harnessing local and outsiders' knowledge: Experience of a multi-stakeholder partnership to promote farmer innovation in Ethiopia.
- UNDP. 2014. Gender and climate change Africa: Gender, climate change and food security. *Policy Brief, 4*. UNDP: New York.
- United States Agency for International Development (USAID). 2009. *Global food crisis*. Washington, D.C.: USAID. Retrieved on 4th April 2015 <http://www.usaid.gov/our-work/humanitarian-assistance/food-crisis>.
- . 2013. *Water and food security: Democracy in development*. USAID: Washington, D.C.
- WFP. 2009. *Kenya food security update*. New York: United Nations.
- World Bank. 2014. *Country profiles: Kenya*. Washington, D.C.: World Bank.
- . 2013. *The World Bank economic review: Impact of the global food crises in self-assessed food security*. Washington, D.C.: World Bank.
- . 2012. *Agriculture innovation systems: An investment sourcebook*. Washington, D.C.: World Bank.

CHAPTER SIX

Farmers' Adaptive Capacity on Household Food-Resource Handling Procedures and Food Security in Rural Western Kenya

Oino P. Gutwa

Abstract

While the rest of the world has made significant progress towards food security, Kenya continues to lag behind. Food insecurity remains pervasive in the country with abundant agricultural endowments. The country is one of the most food insecure in the world. This is a paradox of suffering amidst plenty and yet Kenya has the knowledge, technology, and the means to end food insecurity. Most of the food in the household is lost or wasted along the food supply chain. The present food insecurity problems faced in Kenya are attributed to poor household food-resource handling procedures during agronomic practices, harvesting, processing, storage, consumption and exchange procedures practiced by rural smallholder farming households, which this study endeavoured to investigate. Despite the fact that western Kenya is endowed with both natural and human resources for agricultural production, the region has for several years been languishing in food insecurity. The main research question for the study is: "What causes the paradox of food insecurity in a high potential rural environment?" Consequently, the main objective of the study was to examine how household food-resource handling procedures influence food security in western Kenya. The study was set against Rationalisation Theory propounded by Max Weber (1958). The study used survey research design that employs descriptive accounts in exploring various situations on food security in the country. It also used an interview schedule, interview guide and direct observation as the main methods of data collection. The study found that designing policies that incorporate adaptive capacities of smallholder farmers on household food-resource handling procedures is paramount in achieving sustainable food security. The policies may also contribute to farmers' improved capacities in reducing food loss and waste in the country. This may also act as a springboard for rapid food safety nets in Kenya and other agricultural potential regions around the globe in the realisation of one of the Millennium Development Goals — alleviation of hunger and poverty.

Keywords: Household food-resource, handling procedures, farmers' adaptive capacity, Kenya

1. Introduction

Although the continent of Africa is characterised as being in a situation of chronic food deficit, more than 85 per cent of the rural poor live on land that has a medium to high potential for increased productivity (AFDB 2012). More food is being grown now than any other time in human history. Food and Agriculture Organisation of the United Nations (FAO) in 2007 estimated that crops would be 4.9 per cent higher in 2008 at a record 2,232M tones and 2008 was indeed a record for crop production (FAO 2009). Up to 25 per cent of Sub-Saharan Africa's 852 million people are undernourished; with 15 million people in the Sahel and an equal number in the Horn of Africa facing serious risks, the sub-region is thus becoming the most food insecure region (FAO 2004). Food insecurity in developing world and particularly Sub-Saharan Africa is blamed on lack of farmers' adaptive capacity on food-resource handling procedures that allow severe food loss and wastage before it is utilised by the end users. According to this study, household food-resource handling procedures refer to the food management practices from food production to utilisation. They include household's agronomic activities, storage procedures, food consumption patterns and food exchange (trade) processes. According to Heong (2010) while millions around the world go hungry, much food that can still be consumed is lost or wasted. Prakash-Mani (2013) estimates that 25 per cent of food supplied in the world come from smallholder farmers in Africa, Asia and Latin America. FAO (2014) also projects that 80 per cent of the food consumed in many developing countries in Sub-Saharan Africa and Asia come from smallholder farms. There are hopes that if smallholder agriculture is improved, farmers can also improve their standards of living thereby reducing hunger in their local communities (Prakash-Mani 2013).

Paradoxically, farming households are the most affected in terms of food insecurity and poverty in Sub-Saharan Africa, especially the smallholder farming households as a result of food loss and waste. Cruz (2010) and Valdés *et al.* (2010) asserts that majority (over 80 per cent) of the smallholder farmers are food insecure and depend on land as their primary source of livelihoods. Three out of every four poor people live in rural areas and depend on agriculture either directly or indirectly for their livelihood (World Bank 2008). While the rest of the world has made significant progress towards food security, Africa, in particular, Kenya continues to lag behind (Mwaniki 2006). In the United Nations Development Programme's 2014 Human Development Index, the country ranks 80 among 109 countries that are most food insecure. About a third of Kenya's population are estimated to be food and nutrition insecure (Sorre 2014), while over 10 million people in Kenya suffer from chronic food insecurity and poor nutrition; and between two and four million

people require emergency food assistance at any given time. Nearly 30 per cent of Kenya's children are classified as undernourished, and micronutrient deficiencies are widespread (GoK 2010).

A study by UNDP (2012) indicated that rural infrastructure has deteriorated, farming has languished, gender and other inequalities have deepened and food systems have stagnated. In addition to tackling challenges embedded in the African context, food security strategies will need to respond to major changes in the global food system. New factors such as population pressure, dwindling natural resources including water and soil nutrients and above all, household food-resource handling procedures are reshaping the way food is produced and consumed. In a study commissioned by the FAO, it is estimated that one-third (30–50 per cent) of all food produced worldwide never reaches a human stomach (Gustavsson, Cederberg and Sonesson 2011). This is mainly due to poor household food-resource handling procedures during agronomic activities, harvesting, transportation, storage, consumption and exchange (trade). In this study, a food-resource refers to any material and non-material inputs that affect the production, storage, consumption and exchange of food stuff. This include, labour, food patterns, food choices and sharing. Other factors leading to food loss and waste include financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities in difficult climatic conditions, infrastructure, packaging and marketing systems, consumer behaviour and quality of food produced. In Kenya, food insecurity remains pervasive in spite of its abundant agricultural endowments.

Food security situation in the country is hanging in balance (Barasa 2010). More so, even with accessibility to abundant agricultural resources, most of the rural households particularly in western Kenya are food insecure. This is blamed on the kind of household food-resource handling procedures practiced by smallholder farming rural communities, which promote food loss and waste. According to UNDP (2010), this is a paradox of suffering amidst plenty and yet Kenya has the knowledge, technology, and the means to end food insecurity. Although Kenya's agricultural sector has been revived from a negative growth of 2.3 per cent in 2009 to a positive 6.3 per cent by 2010 (GOK 2010), Kenya is still rated as a high-risk food-insecure country. Most households in Kenya, particularly in the western region, use a large proportion of their resources in order to achieve food security. As such, they become highly vulnerable to food insecurity at certain times of the year. Disappointingly, food is lost mostly during the early and middle stages of the food supply chain.

East African Community (2011) has shown that self-sustaining domestic markets for food are non-existent in the rural areas due to lack of proper planning and institutional arrangements enlightening farmers on adaptive household food-resource handling procedures. Most of the food is consumed by those who produce it, and the surplus production is exposed to wastage. Additionally, in most ecological zones, crop production is seasonal yet household food security depends on a regular and sustainable supply of food throughout the year. According to IFAD, WFP and FAO (2013), policies aimed at enhancing agricultural productivity and increasing food availability, particularly when smallholders are targeted, can achieve hunger reduction even where poverty is widespread. When they are combined with social protection and other measures that increase the incomes of poor families enabling them to buy food, they can have an even more positive effect and spur rural development, by creating vibrant markets and employment opportunities, making possible equitable economic growth. The main question which arises at this juncture is: “are there social and institutional innovations for achieving sustainable food security in Eastern and Southern Africa?” “If they exist, are they well-capacitated to adapt to food security situations in the region?” The main objective of this study, therefore, is to examine how these social organisation and institutional innovations can influence farmers’ adaptive capacity on household food-resource handling procedures on food security in rural western Kenya.

1.1. Statement of the Problem

Just as in the rest of Africa, most rural households in the country including Kisii County earn their livelihood through agricultural production. Although they produce most (over 80 per cent) of the food-resources in the country, and hold the key to addressing the sorry state of affairs, they are paradoxically the majority of the undernourished Kenyans (Sorre 2013). Therefore, arguably, smallholder farmers have been largely neglected by policy-makers and researchers. Many other reasons have been given to explain this situation. However, not much has been ventured on farmers’ adaptive capacity on household food-resource handling procedures. A few studies that have been carried out focus only on a single dimension of the food supply chain such as harvesting, food storage and consumption among others thus, leading to paucity of knowledge on food security. In the light of this revelation, the need for more empirical studies on harnessing the potential of smallholder farmers as a major starting point for effective policy interventions aimed at addressing the food security question becomes imperative.

The FAO, WFP and IFAD (2012) report on the state of food insecurity in the world asserts that despite concerted efforts to reduce

food insecurity in countries worldwide, important data gaps and data quality problems on food loss and waste remain as a major challenge. The report suggests that key improvements are needed on quality of data on food production, storage, consumption and trade (exchange). In this study, food production, utilisation, storage, and exchange are the major indicators of food-resource handling procedures that have been under-researched by many researchers, hence, the need for this study. Further, Gustavsson, Cederberg and Sonesson (2011) revealed that there are major data gaps in the knowledge of global food loss and waste. In fact, insufficient attention appears to be paid to current global food supply chain losses and waste, which are probably substantial. Moreover, the recognition accorded to the critical role of innovative organisations such as social groups, associations and cooperatives and institutional arrangements which institute development policies and legislations and their role in building smallholder farmers' capacity for effective poverty reduction and food security efforts is insignificant. Hence, these gaps are the foundations of this study. Gustavsson, Cederberg and Sonesson (2011) also suggests further investigation into effective technological advancements in production, harvesting, and post-harvest handling systems, drawing on expertise across various disciplines, such as human ecology, social sciences, agricultural economics, food processing, nutrition, food safety and environmental conservation, in an attempt to achieve sustainable food security.

Despite several interventions dealing with food insecurity in Kenya, little has been achieved as they have not given much attention to farmers' adaptive capacity on food resource-handling procedures which include agronomic activities, harvesting and post-harvesting practices such as storage consumption and exchange (trading). As well, innovative practices by various stakeholders on food security interventions whether public or private organisations have not devised innovations and institutional arrangements, which can provide smallholder farmers an array of services including improved agronomic activities, harvesting and processing and market access. This study assumes that organisational innovations and institutional arrangements can result to smallholder farmers' capacity building and therefore, strengthen their negotiating power on management of production resources and improving access to information and knowledge on farming activities. As this will help them build their capacity on sustainable food security. It is against this background that this study unlike other studies, uniquely sought to comprehensively understand the whole food supply chain (from production to utilisation) and how they influence food security status in Kisii County of rural western Kenya.

1.2. Methodology

The study was grounded on a survey research design that allowed representation of opinions from all geographical regions of Kisii County in western Kenya. The target population consisted of residents of Kisii County while the individual households were considered as the units of analysis. The sample size of 377 respondents was determined during the pilot stage. Through survey design, proportionate samples of residents was determined and picked through simple random sampling technique. Purposive sampling was used to pick key informants for the study. Purposive sampling allowed the researcher to select the most desired members of the target population on the basis of information they hold on issues of interest to the study. The study relied on the use of an interview paradigm to collect both qualitative and quantitative data on the three specific objectives of the study. The interview schedule had both open and closed-ended question items. The interview paradigm was chosen for some of the respondents were illiterate to fill a questionnaire. Data analysis was carried out through qualitative and quantitative techniques, with the aid of Nvivo (qualitative data) and SPSS (quantitative data) computer programs. Quantitative analysis involved the use of both descriptive and inferential statistics. Frequencies, percentages, means, standard deviation, and chi square were employed where necessary. Qualitative analysis involved the use of narratives, text boxes, and quotes. The study methodology was set against a conceptual framework (Figure 1).

1.3. Organisation of the Study

The study is organised into four major sections. The abstract precedes the major sections of the study. The first section provides an introduction where a brief background to the study, problem and objectives of the study are described. The second section contains the literature review and theoretical framework that guided the study. The third section presents the findings where results have been logically described, critically analysed and interpreted. The fourth section recapitulates the summary of the findings.

2. Literature Review

Up to 25 per cent of Sub-Saharan Africa's 852 million people are undernourished, with 15 million people facing serious risks in the Sahel and an equal number in the Horn of Africa thus, becoming the most food insecure region (FAO 2011). The latest FAO estimates indicate that global hunger reduction continues. For instance, about 805 million people are estimated to be chronically undernourished in 2012–14, down more than 100 million over the last decade, and 209 million lower than in 1990–92. In the same period, the

prevalence of undernourishment has fallen from 18.7 to 11.3 per cent globally and from 23.4 to 13.5 per cent for developing countries (FAO, IFAD and WFP 2014). Food insecurity in developing world and particularly Sub-Saharan Africa is blamed on the practiced food-resource handling procedures that allow severe food loss and wastage before it is utilised by the end users. The region is making slow progress in achieving international hunger targets, with the Sub-Saharan region especially lagging behind global trends, and one in four people remain undernourished (*ibid.* 2014). In Kenya for instance, rural infrastructure has deteriorated, farming has languished, gender and other inequalities have deepened and institutional food systems have stagnated. In addition to tackling challenges embedded in the Kenyan context, food security strategies will need to respond to major changes in the global organisational food systems and institutional arrangements. While as millions around the world go hungry, much food that can still be consumed are wasted or thrown away. As noted by Gustavsson, Cederberg and Sonesson (2011), one-third (30–50 per cent) of all food produced worldwide never reaches a human stomach. This is due to ghastly practices in food-resource handling procedures during agronomy, harvesting, storage, consumption and exchange (trade). Furthermore, this figure does not reflect the fact that large amounts of land, energy, fertilisers and water have also been lost in the production of foodstuffs, which simply end up as waste. This inevitably means that huge amounts of the resources used in food production are used in vain.

Despite concerted efforts to reduce food insecurity in countries worldwide, important data gaps and data quality problems remain as a major challenge. In achieving food security, there is need for key improvements on data quality on agronomic activities, harvesting and processing, storage, consumption and exchange. This study was based on the realisation that there is paucity of quality data on farmers' adaptive capacity on household food-resource handling procedures and their influence on food security. In this study, food production, harvesting and processing, storage, and exchange were the major indicators of food-resource handling procedures that this study undertook. Additionally, Gustavsson, Cederberg and Sonesson (2011) study revealed that there are major data gaps in the knowledge of global food loss and waste. In fact, insufficient attention appears to be paid to current global food supply chain losses, which are probably substantial. They suggest further investigation into effective technological advancements in agronomic activities, harvesting, and post-harvest handling systems as well as characterising the anthropological and sociological dimensions of food consumption in different cultural and economic settings.

It is understood that food security institutions/agencies encounter many challenges in implementing food security programmes due to lack of evidence-based knowledge and good practices. Literature on food security available in Kenya concerning food security, for instance, (Sorre 2010; Barasa 2010; Murray 2002; and FAO 2000) on cash crop production, food security and nutrition; food security and nutrition policy; rural livelihoods; and the state of food and agriculture, respectively, have done little on farmers' adaptive capacity on household food-resource handling procedures which is the main concern of this study. Besides, Word Bank (2011) found that the impact and success of food resource-handling procedures particularly post-harvesting (processing, consumption, marketing) is influenced by social and cultural norms among smallholder farming households in rural areas. Apparently, most interventions and studies done on food security in Kenya, have not taken into account farmers' adaptive capacity on household food-resource handling procedures. The main argument in this study is that food is always there, what is happening in organisational procedures and institutional arrangements? and how do people take care of efforts put to acquire them and future sustainability? Moreover, increased agricultural production does not necessarily guarantee food security unless something is done on social innovations and institutional arrangements which, directly impact on household food-resource handling procedures along the food supply chain in an effort to mitigate food loss and waste.

Agencies and organisations that fund food systems research have prioritised work on optimising yield, nutritional quality and postharvest life but little on farmers capacity on household food-resource handling procedures as well as avoidance of anthropological and sociological dimensions that influence food consumption patterns and exchange processes in different cultural and socio-economic settings, which also affect home food management and food utilisation behaviour. This study argues that food availability or shortage will depend on farmers' adaptive capacity on food-resource handling procedures such as labour, food storage, processing, distribution, consumption habits and food choices devised by those involved in the food supply chain system. However, this is one of the areas that is under-researched by researchers thus, formed the foundation of this study.

The study therefore, fills a knowledge gap on food resource-handling procedures left by other researchers as proposed by (Gustavsson, Cederberg and Sonesson 2011; FAO, WFP and IFAD 2011; 2012) in their studies. The study also consolidates information of the whole food supply chain since it constitutes an empirical database on food-resource handling procedures through investigation of variables such as agronomic practices, harvesting and processing, storage

procedures, household food consumption habits and food exchange processes. This study provides solid data and actionable recommendations that can be used to improve the quality and effectiveness of food security programmes and policies that enhance farmer's capacity on proper household food-resource handling procedures. Evidence shows that when there is a strong base of institutional innovations particularly among rural organisations, such as communal groups, producer groups and cooperatives providing a full range of services to small producers, they are able to play a greater role in meeting a growing food demand on local, national and international markets (IFAD and FAO 2012). These institutions mostly in the rural areas have to develop a dense network of relationships between smallholder farmers and with market actors and policy-makers. This will impact positively not only in Kenya, but also in other parts of the globe.

2.1. Rationalisation Theory

This study was guided by Rationalisation Theory as propounded by Max Weber (1958). According to Weber, rationalisation is the process by which individuals and institutions become more systematic and logically elaborate according to the general, analytical and calculable principles. The basic assumption of this theory is that, when a decision-maker is confronted with several alternatives of a solution to a problem, he/she has to weigh all the available alternatives on the bases of costs and benefits of each alternative before making a decision. Therefore, the decision made is assumed to be rational in that it enables the decision-maker to choose the alternative that maximises benefits and minimises costs. Weber used cost and benefits analysis as an illustration of a rational decision-making process. Here, means are reached by a systematic study of all relevant information and that the decision made is optimal but not necessarily the best.

The theory explains farmers' capacity to make decision along the supply chain (during the process of food production to consumption). In this case, the decision to engage in food production and the food-resource handling procedure involved are themselves rationality. For instance, farmers rationalise how to attain maximum benefits in their farming activities by considering aspects such as their level of knowledge on agronomic activities, availability of farming inputs, harvesting procedures, processing, storage and consumption patterns and exchange processes that are as a result of their adaptive capacity to proper food-resource handling procedures in the production of food-resources to utilisation. The issue at hand here is the fact that farmers have their own justification behind their decisions to engage in any kind of food-resource handling procedure. This is based on the premise that whether or not the decision will yield optimal benefits in

terms of food security. This can be blamed on lack of institutional frameworks in the rural areas which provide a consultancy service to the farmers. The adoption of a certain household food-resource handling procedure involves individual and/or household choice making process. Household decisions for instance, on how much to store and how much to sell would be influenced by market price, their own consumption needs and storage facilities. However, some households may not make rational decisions on food production processes and food utilisation. This leads to food insecurity in their households due to low levels of awareness for social organisation frameworks and institutional arrangements in rural areas on sustainable food security.

Therefore, Rationalisation Theory is used to explain the farmers actions and/or activities engaged in food handling procedures by providing justification as to what they do, how they do it, when they do it, and why they do it, and whether it eventually ensures household food security or insecurity. Consequently, rationalisation theory ensures that the process of food-resource handling is not only systematic but also deliberate based on the utilitarian principle. This study argues that food availability or shortage will depend on farmer's adaptive capacity on food-resource handling procedures such as labour, food storage, processing, distribution, food consumption habits and choices devised by those involved in production and consuming. Household decisions for instance, on how much to store and how much to sell depend on the market price, their own consumption needs and storage facilities. However, some households may not make rational decisions on food utilisation leading to food insecurity in their households.

2.2. Conceptual Framework

This study was guided by the conceptual framework presented in Figure 1. As presented in the Figure household food resource handling procedures revolve around agronomic activities, processing and storage procedures and food exchange processes. Agronomic activities include land preparation, choice of crops and varieties for planting, labour and harvesting materials, transportation of inputs, weeding and harvesting; processing and storage procedures which include winnowing, de-husking, pest treatment, construction of storage structures, food processing, preservation and control of pests and damage. Household food consumption habits include food sharing, eating habits, dietary needs, food tastes and preferences and socio-cultural factors; food exchange processes include market availability, infrastructure such as roads, transportation, markets, supply and demand, fluctuation of prices and reciprocity.

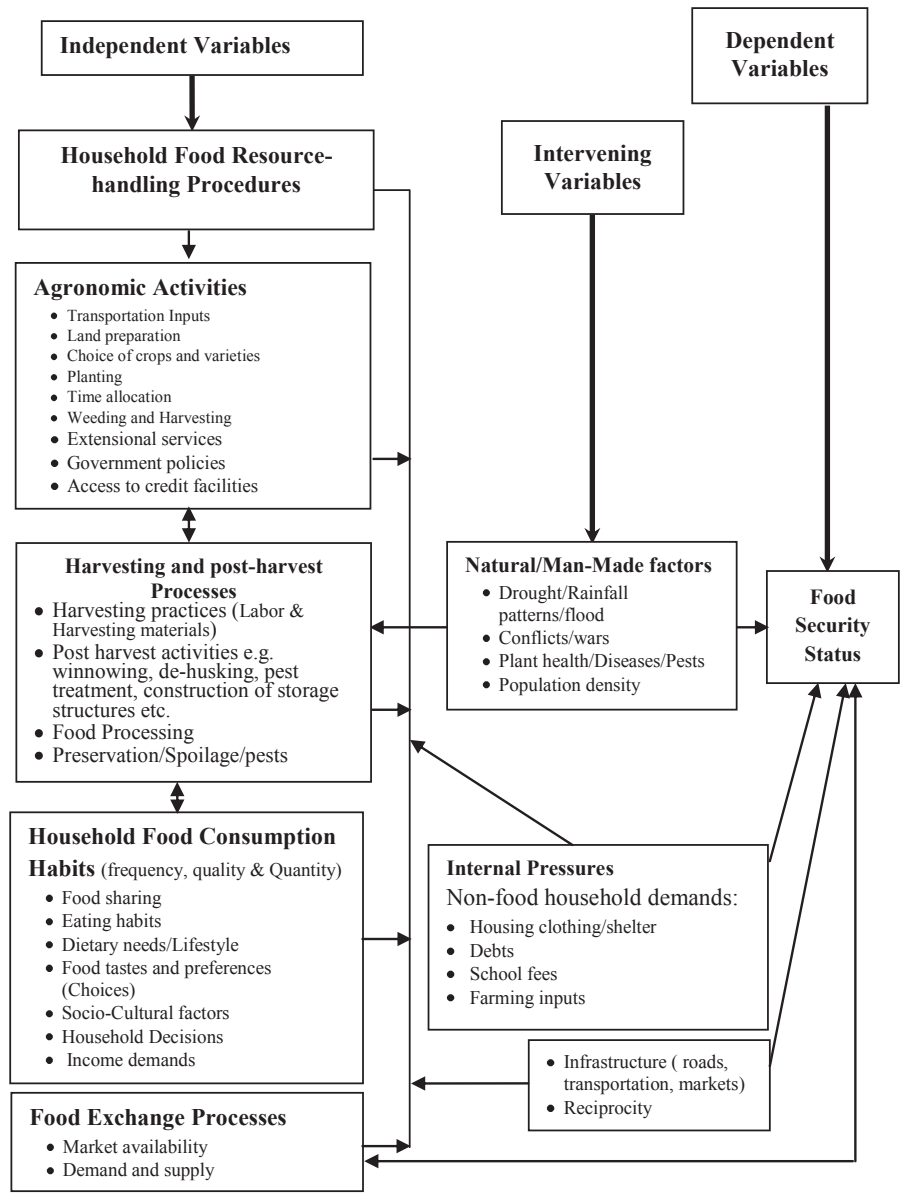


Figure 1.. The Conceptual Framework Guiding the Study

According to the above conceptual framework, the extent to which agricultural production and utilisation potential is harnessed by

farmers, relies on the complex interaction of the food resource-handling procedures which include the ones mentioned above based on the decision made by rural farming households. However, the extent to which the influence of these parameters can be realised will either be enhanced or hampered by micro-factors, natural/man-made factors and internal pressures within smallholder farmers' environment.

3. Findings of the Study

3.1, Food Security Perspectives and Situation in Western Kenya

This study adopted FAO 2006 food security definition that food security exists when all people at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. Over the years, there has been a neglect of the agricultural sector, where countries and international development assistance have consistently diminished levels of investment and funding. Of the most affected are smallholder farmers in rural areas, especially in western Kenya, who are always in dire need of agricultural training and services. In the recent past, new forms of institutional innovations have emerged to respond to the numerous constraints that smallholder farmers face in rural areas. These innovative organisational and institutional arrangements such as development policies, legislations and practices can help facilitate the provision of smallholder farmers with an array of services including improving agronomic activities, harvesting and processing and market access in an effort to strengthening smallholder farmer's capacity in food-resource handling and management. They are also an effective means to empower small producers by helping them build their capacity to formulate and express their needs and concerns within their organisations and vis-à-vis influential economic actors and policy-makers.

Reducing food loss and food waste through farmers' adaptive capacity on household food-resource handling procedures was the main focus of this study. This carries the potential to considerably increase the efficiency and utilisation of food security strategies in the whole food supply chain. The study started by asking the smallholder farmers about their perception of food security. As perceived by farmers during the study, food security refers to the ability to obtain an adequate diet for all household members throughout the year. To achieve food security, farmers reported their interest in opportunities to start small income generating activities and accessing microfinance institutions in obtaining capital to purchase farm equipment to improve their farm productivity. However, the respondents indicated that they face many obstacles in

accessing financial opportunities from financial institutions as they are required to offer a collateral security to recoup the formers' possible loss. Farmers also expressed their interest in opportunities that would help them improve their capacity in modern agricultural knowledge and in achieving food security, which were non-existent at the grassroots during the study period. Those who were most affected were women, and that was due to their inability to own resources in the household. The findings of the study indicated that women in rural western Kenya are not recognised as farmers by their husbands and/or families or communities. The patriarchal nature of families in western Kenya, aligned with traditional values and cultures as in most traditional African societies, show that women are inferior beings in the society. From the author's point of view, this is also reflected in institutional frameworks such as development policies, legislations and practices in the country and around the globe, which ignore the needs of women farmers. As quipped by one of the key informants:

Women are ignored when it comes to policy, legislation, extension services and/or other support from institutions including government, and therefore, will depend on men's decisions on all matters. (A 48 year old female informant).

From the above finding, it is evident that women are less recognised in farming practices, hence, they are frantically short of secure, knowledge, and support from relevant parties to promote food production. Additionally, women do not have access to adequate land, basic tools and inputs and credit. Above all, they do not access extension services and technical advice to adopt appropriate modern technologies in an effort to achieving a sustainable food security and yet, they are the ones who shoulder the burden of producing, preparing and serving food to their household.

3.2. Smallholder Farmers' Level of Education and Vocational Skills

The level of formal education and vocational skills are important variables in any given population. This is because they influence not only the demographic structure but also socio-economic characteristics of the population. The 377 respondents interviewed had varied levels of education. The majority of the respondents, 249 or (66 per cent) of them had reached primary level, while 107 or (28.4 per cent) had had attained secondary education. It was only 7 (1.9 per cent) of the respondents that had reached university level, 5 (1.3 per cent) had reached college level, while 9 (2.4 per cent) of the respondents had no formal education.

From the above data, most of the respondents in the sample population had reached the primary level of education. This

manifests a cohort of low educational level among the members of this community, which translates into a semi-skilled labour force that is largely confined in the rural settings. The study noted that the level of education of the parents was crucial in determining the education status of the children. The study observed that, parents who had reached tertiary and/or university levels of education had the initiative to educate their children to the highest level of education as possible. The majority of the remaining parents were contented with their children finishing the primary or secondary levels of education and getting married. A study conducted by (Makombe, Lewin and Fisher 2011) predicted that, extending the education of household heads would reduce food insecurity in Malawi for the reason that farmers extending to 12 years to secondary education are particularly effective in food production as they are also able to access vocational training to improve on food production.

From the foregoing analysis, it can be deduced that education refers not only to formal training as such, but also the knowledge that could be used in pursuit of food security. The author argues that educated population easily access new information and this helps them consider appropriate institutions that can deliver appropriate technologies for new innovations. Smallholder farmers should also be informed on how to invest in local institutions and develop their absorptive capacity to facilitate technology exchange among themselves in rural areas besides, enhancing their ability to work with the various stakeholders, such as the government and private firms to improve their food security. Education, therefore, becomes a background variable in the campaign to food security at the household and community level.

The respondents were then asked if they possessed any special skills, knowledge or professional training instrumental in attaining food security in the study area. The special skills, knowledge and/or professional training question posed to the respondents was pegged on the assumption that, even if the majority of them lack formal education, they may have some knowledge, skills or professional training on agronomic, harvesting and post-harvesting procedures provided by existing national or local institutions that can help them improve food security in the study area. The study found out that the majority of them, 280 or (72 per cent) of the respondents did not have any special skills, knowledge or professional training, while 97 (28 per cent) had knowledge and skills, and professional training. These included skills on agronomic activities, new technologies on harvesting and grain storage.

Most of these skills were acquired in training institutions organised by various stakeholders such as the government, NGOs and corporate organisations. Government agricultural extension officers visited

villages to train smallholder farmers on various aspects on farming. As a result, the skills received during these trainings and sensitisation schemes were found to be inadequate. For example, agricultural officers from government institutions visited farmers irregularly, and this rendered some smallholder farmers to low agricultural food production in the study area. This study corresponds with what (Sorre 2005) in his study in western Kenya found that extension officers were more office bound, and so not doing their work as it were in the 1980s to early 1990s when farmers were taught various methods of farming, soil conservation and livestock keeping strategies.

In an interview with a key informant who was an agricultural officer, it was evident that the agricultural extension offices have been understaffed for a long time and cognisance of the terrain and geographical diversity of most parts of rural western Kenya means a few places could be reached with few officers. It, therefore, implies that the number of smallholder farmers to be reached is absolutely minimal. The study also found out that some Non-governmental Organisations (NGOs) organised awareness events at the community level whereby they mobilised farmers to attend, even though, these activities were occasional and unsustainable. Moreover, these NGOs could not reach out most of the community members with their sensitisation activities. The resultant effects of the farmers' constraints discussed above are not only impeding the delivery of extension services, but also militating against sustainability of food security in rural western Kenya. This is noticeable from most smallholder farmers' lack of adaptive capacity on proper household food-resource handling procedures, and the resultant challenges in achieving sustainable food security. These new challenges require renewed efforts and fresh approaches in service provision and innovations from the side of the government to support smallholder's agricultural activities and improve their productivity and resilience.

As the author asserts, there is need to value farmers especially those in rural areas given their contribution to the rural economy and national economy as well. This is supported by (IFAD 2009) that there is a need to go beyond the traditional 'farmer/researcher/extensionist' triangle to encompass a dynamic and multidisciplinary innovation system that links various and diverse stakeholders at the local, national, regional and global levels. This is for the reason that supporting smallholder farmers' activities and their social organisations is key to enabling them to identify farming needs and priorities, and empowering them adopt new innovations aimed at promoting their agricultural production activities.

The study further investigated the level of monthly income of the respondents. The study found out that majority 229 (60.7 per cent) of

the respondents' income was below 2000 per month, followed by 58 (15.4 per cent) whose income was between (2001–4000). This implies that the respondents fell below the minimum standards expected by Food and Agriculture Organisation (2011) which reports that households must have sufficient income to purchase the food they are unable to grow. This is confirmed by the findings where the respondents were asked whether the income they earn is adequate to meet their basic household needs like food supply and/or purchase as well as practicing agronomic activities and post-harvest management practices.

The study established that majority 300 (79.6 per cent) smallholder farmers didn't have adequate income to meet basic household needs such as food, shelter and education for their children. Whereas only 77 (20.4 per cent) had disposable income to meet basic household needs. The majority of the respondents in this category were those employed in the public service, Non-governmental organisations and those who were self-employed. The study also established from the respondents whether or not their children were employed in the formal sector. In this context, 'employed children' refers to those who are above eighteen year olds, finished their secondary school education, and have accessed some form of employment. The data collected indicated that majority 226 (60 per cent) of the respondents children were not employed in the formal sector, 132 (35 per cent) of the respondents had one child employed, 10 (2.7 per cent) of the respondents had two children employed in the formal sector. It was also evident that those respondents whose children were employed were still dependent on their families in the purchase of farming equipment and other inputs.

3.3. Agronomic Activities

The study was intended to know the methods used by rural farmers during planting season. The majority (72 per cent) of the respondents used traditional methods in farming practices including the use of organic manures, local seeds for planting, use of family labour in preparing land for planting among others. On the other hand, 28 per cent of the respondents used modern technologies in farming including mechanised farming, use of hybrid seeds and modern fertilisers. From the literature review, hybrid seeds are basic agricultural input and more importantly, quality seeds of any preferred varieties are the basis of improved agricultural productivity since they respond to farmers' needs in productivity and crop use (Pelmer 2005). It has been proved that those farmers who receive certified seeds from known sources get better yields per capita from cereal production than those farmers who do not. Improved seed variety is an important input in all crop-based farming system and is a key factor in determining the upper limit of yields. According to

Morris *et al.* (1999), of all inputs used in crop-based agriculture none has the ability to affect productivity more than improved seeds.

The researcher, therefore, observes that if farmers can obtain improved seed varieties that perform well under local conditions and adopt it, the efficiency with which other inputs are converted into economically valuable outputs increases and productivity will increase. As observed by (FAO 2010), smallholder farmers' adaptive capacity involves an array of both technical and institutional responses, which may be inspired by both indigenous or external knowledge and experience. For instance, adaptive cropping systems, more efficient irrigation techniques, and new forms of water harvesting, alternative ways of preserving soil fertility, novel forms of pest and disease control as well as improved technologies for early warning, can increase farmers' production yields.

Evidence from the study indicates that most rural farmers adopt traditional methods in practicing agronomic activities as they are slow in adopting new innovations enhancing agricultural production. It is apparent from policy-based perspectives that traditional methods and/or approaches to farming are increasingly challenged by a rapidly changing scientific, social, and economic environment, entry of new actors, technologies, and innovation institutions in the agricultural sector. As observed by Irz *et al.* (2001) and IFAD (2011), new agricultural technologies can influence the poor directly, by raising incomes of farming households and indirectly affecting positively household food-resource handling procedures thus, minimising food losses and waste. Therefore, smallholder farmers can double their productivity by using quality hybrid seeds. As opined by Howard *et al.* (2003), adoption of seed-fertiliser technologies alone can bring double cereal yields and will be profitable to farmers in rural areas. New technologies can be possible if they are embedded in new institutional solutions. According to FAO (2013), institutions are formal and informal rules and organisational forms and policies through which society is ordered. Examples of institutional responses include the instalment of new market mechanisms for the development of credit and payment mechanisms, adapted land tenure arrangements and contracts, new organisational forms and laws for the management of water catchments, re-organisation of input supply, marketing arrangements for new cropping systems, and the use of alternative procedures and methodologies in research and extension systems to enhance collective adaptive capacity in communities, regions and countries.

The researcher sought to understand the reasons behind practicing organic farming. The study revealed that organic farming was largely practiced by smallholder farmers in the study area as a sustainable food production option. This included, the substitution of resources

produced on farm for purchased synthetic fertilisers and agricultural pesticides as well as the use other effective mechanisms such as crop rotation to achieve effective and efficient food production. Farmers also practiced on-farm resources including crop residues, green manure, cover crops for soil fertility, weed control, and livestock waste. However, the study found that most farmers practicing organic farming have also adopted livestock farming, and are now practicing improved livestock housing management systems such as zero and semi-zero grazing. This provided farmers with affordable way for smallholders to intensify production in the rural setting by using assets smallholder farmers already posses. The findings concur with a previous study by (FAO 2002) that organic farmers face supply constraints such as provision of adequate organic inputs, which are expected to increase especially in high potential areas. This is attributed to lack of institutional arrangements to supply such inputs to farmers at affordable prices.

In reviewing available research documents, the author found that there is limited policy information on organic farming in the country, especially, in rural areas. Therefore, the researcher argues that there is a dire need for availability of policy information within the domain of agriculture to support organic farming. Enabling policies such as specialised research and institutional and/or community based extension services geared towards providing knowledge in terms of integrated pest and disease control, value addition and marketing should be pursued. As well, smallholder farmers need specific research and innovation on adaptation to modern technologies on agronomic practices. There is also a need for awareness creation among the farmers in developing countries to cultivate a large number of varieties of crops, which consequently, mitigate risks arising from potential climatic situations or sudden insect attacks and diseases. This will enhance the resilience of agricultural systems in potential areas.

3.3.1 Crops Grown by Smallholder Farmers in Western Kenya

The major food crops grown in western Kenya region include maize, beans, Irish potato, cassava, sorghum and millet. Households were asked to identify the in staple food on which they depend. It was established that maize is the main staple food in western Kenya, contributing more than a third of daily caloric intake by the average household member. Western Kenya is also called 'bread basket', where most of Kenya's maize is grown. However, where this research was conducted, most households were smallholder farmers whose produce was mainly for food consumption. This was attributed to high population that led to land subdivision hence, ownership of small plots of land by households. During harvesting, the farmers were faced with many challenges.

Data collected showed that losses, particularly, in maize grain and other cereals occur at all stages of the post-harvest value chain, leading up to a total loss of about 14 per cent of the produce. The findings showed that smallholder farmers were largely excluded from national and international interventions aiming at post-harvest loss reduction, considering that 80 per cent of the food produced in western Kenya, is produced by smallholder farmers. From these findings, it is evident that post-harvest loss reduction has not yet received sufficient attention at grassroots level in western Kenya. As such, even if its significance in the achievements of food security is increasingly recognised, it has not yet been sufficiently enacted.

Farmers interviewed during the study were most interested in ways to improve their capacity on household food-resource handling procedures in achieving their household's food security, particularly along the food supply chain. Findings from both key informants and focus group discussions demonstrated that smallholder farmers' well-being had significantly declined due to food loss and waste along the food supply chain. As one participant in a focus group discussion asserted:

We produce enough for our families but it doesn't last long, because of food loss during rainy seasons, infestation by pests and consumption processes (A 33 year old female participant)

The finding above indicates that smallholder farmers store food without applying the right pesticides hence food damage by pests. Most participants in the study also argued that unpredictable weather and lack of access to capital are some of the constraints in improving food harvest, consumption patterns and exchange.

3.4. Harvesting and Post Harvest Procedures

Overall, post-harvest losses in Kenya have previously been estimated at 30 per cent of all maize grains and other cereals produce. This study defines post-harvest losses as a measurable quantitative and qualitative unintended loss in maize grains and other cereals, which makes it unavailable or unfit for human consumption. This occurs along the food supply chain but predominantly in the phases of harvesting and post-harvest handling processes. The loss can be attributed to insects, rodents or microbial growth during storage and loss during transportation. During the study, most farmers in the rural areas in western Kenya observed that food loss and waste is directly associated with decreasing farm size, declining soil fertility, erratic weather patterns and the emergence of a devastating storage pests such as weevils.

The researcher sought to understand how harvesting lead to food loss and waste. Although time of harvesting fall under pre-harvesting period, its effect has direct linkage to post-harvest challenges. The

farmers were asked to state factors that lead to food loss and waste in the study area. The study found that 45 per cent of food loss and waste was caused by delayed harvesting due to infestation by pests in the field, which are also transported to storage facilities. Thirty per cent of the respondents said that grain rotting was another cause of food loss and waste particularly during incessant rainfall which was evident during the study. Therefore, wet weather during harvesting period adversely affects the management of grains and other cereals. A key informant who was one of the village elders said that wet weather has majorly affected maize grains thus, causing aflatoxin contamination. Available literature in the agricultural ministry at Kisii County indicates that grains contaminated beyond 10ppb with Aflatoxin are rendered unfit for human consumption and hence, not marketable. As reported by one of the respondents:

Most of the farmers just like myself, don't throw away rotten maize but we sell to local brewers who use it for preparing "busaa"- local alcohol, and also mix it with unrotten maize to make flour for human consumption. (A 47 year old male respondent).

From the above evidence, it is apparent that most of the farmers are ignorant of the risks associated with use of rotten maize and therefore, use it for other purposes for consumption. The researcher quips that timely harvesting is crucial to reducing losses during harvesting. Therefore, harvesting should be timed to coincide with dry weather to reduce food losses and waste. The respondents were asked to state the methods they use during harvesting of grains. The research found that rural farmers in western Kenya preferred manual harvesting than mechanical harvesting because of their financial capacity and small piece of land. During harvesting, farmers dropped de-husked cobs on the bare ground, which were collected later by individuals by use of a 'gunia' (sack) or bulls/donkeys using carts. As explained by some respondents, the harvested grains may lie on the ground for some days as they seek for means of transport that is (car, pick-ups, individuals, donkey or bulls for pulling cart. One of the respondents narrated that:

During this time of the season everyone, is harvesting grains and therefore, one has to book early means of transport which are scarce, and as you are waiting for help, maize on the ground may start rotting before you find someone to help you to transport to the homestead for storage and consumption (A 53 year old male respondent).

The above evidence implies that the probability of aflatoxin contamination increases with wetness. According to (Kaneohe 2011) in Kiriti (2014), mycotoxins are an identified food safety problem in Kenya and there have been a number of human and animal illnesses and deaths attributable to aflatoxins. Most farmers in the study area

are not aware of the food safety issues associated with mycotoxins. They are also not aware of the harvest, drying and storage techniques necessary to prevent mycotoxin growth. According to (WHO 2002), safe food contributes to health and productivity and provides an effective platform for development and poverty alleviation in the society. The researcher observes that the above outcome is associated with weak institutional support networks from the government and other stakeholders on food security. Therefore, a strong institutional support and a favourable external environment are imperative.

The respondents were further asked how they dried their grains from the farm. Overwhelmingly, 85 per cent of respondents said that they dried their grain on bare grounds particularly, where animals graze. However, they were not aware that the practice increases chances of grain contamination. About 12 per cent of the respondents dried the grains using a drying crib, canvas or a raised platform. Only 3 per cent of the respondents waited for grains to dry in the farm. While harvesting, they transported immediately to storage facilities in the homestead. However, some farmers said that this practice subjected their produce to theft by other people while it is on the farm as a result of which their harvested produce becomes low. The researcher was interested to know how smallholder farmers prepared their grains after farm. Over 80 per cent of farmers in western Kenya shelled particularly, maize and beans grains through physical beating. Conversely, to some respondents, this practice resulted in grain cracking. Farmers were asked which stage they perceive as the stage where most losses occur. The results are shown in Figure 2.

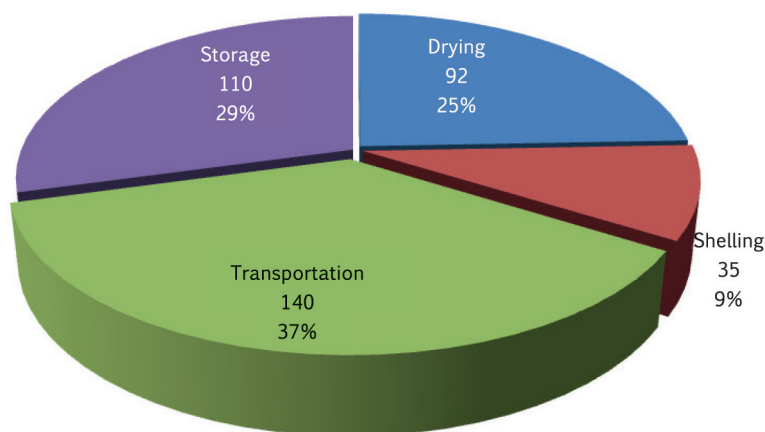


Figure 2. Phase of Food Loss During Harvesting/Post-harvesting Procedures

As presented in Figure 2, 140 (37 per cent) of the respondents said that most of the grain losses are experienced during transpiration from farm to homestead since they are heedlessly thrown and crushed within the cobs. Additionally, in case some of the maize falls down, the person carrying the cobs on head does not have the possibility to pick it up again because of heavy load on the head, as well, if carried by animals using carts, it may fall down and end-up being stepped on or eaten up by lack animals. The losses also occur due to overloading in the carts and also because of bad roads. 110 (29 per cent) of the respondents said that much of the grain loss occurred during storage process. One of the common complaints from farmers in the study area is lack of proper storage facilities to take advantage of better off-season prices, lack of vital market information and inadequate rural credit. Post-harvest management of maize grains and other cereals has to do with pest damage in storage. The most significant insect associated with maize storage is the grain weevil whose infestation starts right from the field and brought into the store. Grain is usually most susceptible to damage when it is stored under high grain moisture content. Untimely dusting with the recommended pesticides using the right rates and lack of scouting during storage also contributed to food loss. Additionally, poor dusting practices increased insect activities leading to loss of quality through damaged grains and fungal infection. This eventually affects marketability of the produce negatively.

From the findings of the study, food loss during storage varies considerably between knowledgeable farmers who were reported at 28 per cent and those who were reported as not conversant at 68 per cent on how to improve storage facilities in the study area. The second highest grain loss occurred during drying process at 92 (25 per cent). This was influenced by the fact that the study was carried out during harvesting season when the western region was experiencing heavy rains and the maize grains had to lay on the ground for longer periods to dry before storage. Hence, high chances of infestation by microbial growth are observed. One of the participants during a focus group discussion said that:

After the grains have been harvested, they are usually spread out in the sun to dry before the actual storage begins. The owner then confirms that the grains are completely dry before storing them in the granary or any other storage available or preferred by the household (A 36 year old f respondent).

Research has indicated that cold storage preserves produce for at least two weeks. It was also evident that untimely harvesting caused food loss for example, during rain seasons. Strategies of post harvest losses in maize can include proper conditioning of grain by sun drying to acceptable moisture content. According to Odeyemi and

Daramola (2000), when it is hot or wet, food-resources will not rot quickly. During the study 35 (9 per cent) of the respondents said that grain loss occurred during manual shelling. Notwithstanding, this being a cheaper method of shelling among rural households in western Kenya, it also made maize more susceptible to contamination, as the grains easily scatter on the ground during the wet season. The researcher sought to investigate the kind of storage facilities used by farmers in the study area. The findings are shown in Figure 3:

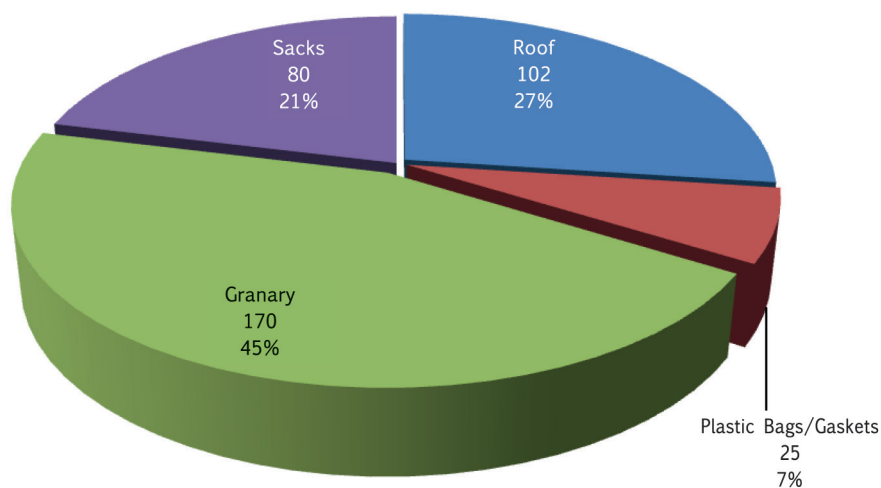


Figure 3: Storage Facilities Used by Smallholder Farmers

Figure 3 above shows that 170 (45 per cent) of smallholder farmers stored their grains and other cereals in the granary, while 102 (27 per cent) stored it in the roof of their houses, while 80 (21 per cent) of the respondents stored in sacks and 25 (7 per cent) of the respondents stored in plastic bags and/or baskets. However, from the researcher's own observation, smallholder farmers in the study area are not aware of the fact that grains stored in plastic bags and with relatively high moisture content for slightly longer periods (1 or 2) months, are likely to develop fungal infection, which are detrimental to the health of human beings.

From the researcher's own point of view, despite the available resources and laudable programmes and policy undertaken by government to boost agricultural productivity in the country, farm produce in western Kenya suffers from a serious neglect on the part of these institutional innovations by government and research institutions. Most notable is the neglect of household food-resource handling procedures, which contribute to most food loss and waste in

households, but have not received a significant attention by the government, research institutions and scholars.

The researcher, therefore, argues that for improved food security, appropriate mitigating measures against these losses need to be instituted early enough for enhanced food security. For instance, from the policy perspective, the Kenya National Food and Nutrition Policy specifies measures and actions to be implemented so as to ensure food security and nutrition which affirms access to nutritionally adequate and safe food for every person in Kenya. Therefore, much attention should be paid to storage and processing procedures in an effort to improve food security in Kenya.

Analysis of policy documents by the researcher indicates that the Kenyan government through its policies is committed to increasing agricultural production through subsidies in fertiliser and seeds. However, it does not give much consideration to addressing other key factors, associated with food-resource handling procedures such as storage and processing, consumption patterns and exchange/trade. This is important for the reason that proper food-resource handling procedures promote good infrastructure such as granaries, silos, and road networks which, are essential in promoting sustainable food security. In particular, road transportation and communications infrastructure may also empower rural households ,especially, women who are often tied to their homes by offering greater mobility for marketing, seeking health care, attending school and networking (Quisumbing and Meinzen-Dick 2001).

3.5. Consumption and Exchange Patterns

Smallholder farming in the rural areas in Kenya is considered as one of the biggest and impoverished sectors. The study was intended to determine how smallholder farmers in rural western Kenya consumed food they produced from their farms. From the anthropological perspective, culture dictates how traditional households consume and exchange food items. According to Wandere (2009) in his study in western Kenya ‘institutionalisation of hunger’ culture includes the individual’s religion, ethnic identity , and beliefs about food, and helps determine what an individual deems proper to eat. With regard to their level of knowledge or understanding of food consumption and exchange patterns, the study established that, however, little food rural households produce, household members are socialised on the type of food that is healthy for them and how to prepare it for consumption. When members of the household are food insecure, they also know how to locate the food-resources, how to cook, prepare and preserve what they have for future use. One key informant confessed that:

Some of us do not harvest enough for our families and therefore, depend on our friends and neighbours to share food items in meeting our needs (A 54 year old male Informant).

From the above evidence, it is clear that these smallholder farmers lack knowledge of modern ways of farming which could be applied to handle food loss and waste. However, some households are able to make decisions on how to mitigate the problem of little food harvest and dietary needs by practicing reciprocity. According to Burgra, (2002), reciprocity is the informal sharing of food-resources between members of society. In rural farming households, sharing of food-resources are personal exchanges among individuals rather than a decision made by society collectively. During the study, it was revealed that most households in the study area are financially insecure and therefore, disadvantaged in accessing food resources for their livelihood. For that reason, smallholder farmers rationally decide to sell off what they have harvested immediately at meagre prices.

Farmers were asked about their customers to whom they sell their farm produce. The study found that most of the respondents do not sell their grains and other cereals to traders because they harvest very little for bare survival. It was also revealed that most families have big family size. Therefore, whatever produce they harvest is used for household consumption. But, they sell grains after production regardless of price on offer in order to meet their various needs in the household. However, a few who had big acreage of land (above two acres) spared some grains for sale. Though most of them did not have direct access to market for their food items. This rendered them other threat such as low prices. One of the key informants narrated that:

Farmers are always exploited by middlemen just after harvesting when there is a lot of stock in place and prices are very low, and do not have linkage to high value market systems (Male Informant 51 years).

The above findings are similar to what was found in the Philippines, where smallholder farmers were exposed to an environment vulnerable to exploitations by dominant groups like traders, and manufacturers. The researcher points out that, innovative social organisations and institutional arrangements should encourage collective marketing through groups, associations or cooperatives to enable smallholder farmers to reduce their transaction costs and risks and improve their bargain power in the market system.

3.6. Adaptive Capacity for Smallholder Farmers in Curbing Post-harvest Losses

According to this study, adaptive capacity is the ability of a smallholder farmer to develop skills that may enable him/her to cope

with current demands for food security. The study found out that farmers were challenged to adopt new technologies in mitigating food loss and waste in the whole food supply chain. It was also established that the adoption of any new technology by smallholder farmers carries with it an element of a risk factor due to unfamiliarity with new technology and inexperience. The research established that the adoption of post-harvest technologies by farming households in western Kenya is very low and is attributed to low level of knowledge on new modern technologies. Additionally, lack of extension services as well as attributes such as demands for extra labour for harvesting, drying, shelling, threshing and storage processes is worth mentioning. One of the participants in the study quipped that:

Because of low adoption of new technologies during post harvest, we are subjected to various adversities such as rotting of grains and theft in times of food shortage (A 42 year old male informant).

From the above findings it is evident that lack of/low adoption of technologies aggravates post-harvest food loss and waste. This is attributed to the failure of government institutions to sensitise smallholder farmers on the importance of adopting new technologies on sustainable food security. These findings partly concur with World Bank's (2011) report, which discovered the prevalence of low adoption of post-harvest technologies in most Sub-Saharan African countries. In a key informant interview with one of the Kisii County agricultural officers, it came out clearly that in Kenya particularly smallholder farmers in western rural Kenya need to adopt modern technologies in order to reduce post-harvest losses. Literature documents from the Kisii County Agriculture development office showed that the damage after post-harvest ranges from 10 per cent to 50 per cent depending on the type of produce. Therefore, adopting temperature management practices, especially, for grains and cereals is deemed necessary to curb the huge losses. Thus, low temperatures reduce the rate of deterioration of most agricultural products, and hence, slow down microbial activity which guarantees farmers a grace period of marketing

During a focus group discussion with selected farmers in the study area, it became evident that, weevils were a major cause of post harvest grain losses. This is because poor storage facilities and substandard storage pesticides have aggravated the attack and losses. As one participant said:

Life has been difficult for us as we are forced to sell all our produce immediately after the harvest to avoid such losses (A, 43 year old female participant)

The literature review, revealed that Sub-Saharan Africa, including Kenya, lose over \$4 billion U.S. dollars annually as a result of post-harvest maize grain losses due to lack of storage facilities. In Kenya for instance, food waste and losses occur mainly at early stages of the food value chain and can be traced back to financial, managerial and technical constraints in harvesting techniques as well as storage and cooling facilities. According to Kenya Agricultural Research Institute (KARI), in Kenya, at least 20 per cent of food is wasted after harvest due to lack of proper storage. This is largely attributed to weak linkages between the research institutions and the agricultural sector. KARI proposes a lot of research on household food-resource handling processes to achieve food security. This can help provide smallholder farmers with knowledge on household food-resource handling procedures. It can also help to address post-harvest losses as well as educate them about good and effective food consumption behaviours and ensure a stable market for their produce throughout the year. The management of post-harvest losses could also act as an incentive for farmers to produce more as higher returns on investments would make farming a more attractive venture.

Most smallholder farmers in western Kenya are faced with adversities in achieving food security attributed to poor household food-resource handling procedures. The study found that some of the respondents managed their lives by adopting various communal strategies including group harvesting and transportation and food sharing. As opined by Lomnitz (2002), societies create adaptive mechanisms to counter the shortcomings of market systems. As mentioned earlier in the study, reciprocity is one of the main strategies employed by smallholder farming households to mitigate food insecurity. In this study reciprocity is non-economic mechanism that is used to provide food-resources to those who are unable to fully participate in market economies. This is a communal activity based in shared beliefs and norms, which are practiced by smallholder farmers.

The researcher argues that collective activities among rural smallholder farmers such as investments and acquisition of agricultural inputs represent some of the adaptive capacities for smallholder farmers to reduce food insecurity in western Kenya. For instance, the innovative institutional arrangements such as formation of social groups and/or clubs, associations can help smallholder farmers increase their capacity to mitigate a myriad of challenges including credit inaccessibility, knowledge inaccessibility and market inaccessibility. This will enable them reduce their transaction costs and risks to brokers who compromise market prices in favour of their produce and thus, improve their bargaining power in the market system. This study proposes that smallholder farmers' organisations should be recognised as key partners in decision-making and in

providing agricultural services by creating institutionalised, representative, inclusive and binding spaces for participation.

3.7. National and International Standards on food Security in Kenya

Food security is multidimensional concept encompassing food availability, affordability, adequacy, safety and quality. Policy-based strategies on food security include providing food-based safety nets and social protection programs, rural development strategies supporting agricultural research; and human capital investment. What then is the springboard? The researcher believes that policy instruments can guide the development of the agriculture sector in the desired direction. Kenya has at its disposal local and international policy instruments to guide its agricultural sector in general and food security outcomes in particular. For instance, The UN Committee on Economic Social and Cultural Rights provides that national strategies should include guarantees of rights to land for women as a means of preventing discrimination in access to food and resources. In May 2012, the Committee on World Food Security officially endorsed the voluntary guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the context of National Food Security. These guidelines comply with all programs, policies, and technical assistance intended to improve governance of tenure and the international human rights framework.

In 2008, the Government of Kenya launched Kenya Vision 2030 as the new long-term development blueprint for the country whose focus was to create a 'globally competitive and prosperous country with a high quality of life by 2030'. Given the central role the agricultural sector plays in the economy, the government finalised the Agricultural Sector Development Strategy and the 2009 Land Policy under the new constitution to integrate ecological principles as a bases for food security management in Kenya though not much has been achieved so far. Gitu (2006) and the food security and nutrition policy (GoK 2008) gives a comprehensive analysis of food security challenges and corresponding solutions and strategies. However, both of them do not satisfactorily address the farmers' adaptive capacity on household food-resource handling procedures. The importance and central role of food security is outlined in various national and sectoral policies and strategy papers including amongst which are Poverty Reduction Strategy Paper 2001, Economic Recovery Strategy for Wealth and Employment Creation 2003–2007, Strategy for Revitalising Agriculture 2004-2014, Kenya Vision 2030 mentioned above and the 1st Vision 2030 MTP, the Agriculture Sector Development Strategy 2010–2020, United Nations Millennium Development Goals (MDGs) Comprehensive African Agriculture Development Programme (CAADP) of the New

Partnership for African Development (NEPAD) 2002, Food Policy (Sessional Paper No. 4 of 1981), National Food Policy (Sessional Paper 1 of 1994) and National Food and Nutrition Policy (NFNP).

All these strategy papers, policy documents and interventions are aimed at increasing the quantity and quality of food available, accessible and affordable to all Kenyans at all times. This is through creating public awareness, promoting and enforcing appropriate guidelines, standards and regulatory framework, promoting public-private sector partnerships in improving food quality and security. Public awareness is aimed at building capacity among smallholder farming households. The researcher notes that this can only be possible through institutional coordinating mechanisms at both national and county levels, without prejudice to a multi-sectoral food security approach in ensuring food security.

The government also needs to act in full swing through its Medium Term Expenditure Framework to achieve food security in the country. More resources are needed to educate farmers on household food resource handling procedures. The resources can be obtained through or from partnerships with relevant stakeholders such as Eastern Africa Grain Council, United States Development Agency (USAID), East Africa's Competitiveness and Trade Expansion Program, Swedish International Development Agency, Danish International Development Agency, European Union, and African Union in promoting approaches that help farmers to improve their productivity and food security across the country.

4. Summary of Findings

The agricultural sector is the mainstay of the Kenya's economy. The sector directly contributes 24 per cent of the GDP and 27 per cent of GDP indirectly through linkages with manufacturing, distribution and other service related sectors. Over 80 per cent of the populations particularly, living in rural areas, earn their livelihoods mainly from agricultural related activities. Due to these reasons the government has continued to give agriculture a high priority as an important sector for promoting national development. In fact, not much has been done to improve farmers' adaptive capacity on household food-resource handling procedures, which is the main contributor to food security in the country.

Smallholder farmers in rural western Kenya are the drivers of many economies in rural households even though their potential is often not actualised. They are exposed to limited resources as they own small-based plots of land on which they grow subsistence relying almost exclusively on their families and/or communal manual labour and other traditional methods of farming. The main characteristics of

production systems of smallholder farmers are of simple, outdated technologies, low returns, and high seasonal labour fluctuations. Smallholder farmers in the study area are characterised by small farm size, scarcity of resource food and cash crops, livestock and off-farm activities, their use of external inputs and hired labour.

There is therefore, a need to significantly increase the productivity of smallholder farmers to ensure long-term food security. This can be achieved by, among others, encouraging smallholder farmers to pursue proper household food-resource handling procedures, which promote sustainable intensification of production and induction of risk-minimising conservative attitude towards food production by embracing biodiversity farming. Smallholder farmers in western Kenya encounter various challenges that impede their growth and ability to effectively contribute to food security. Some of the constraints they face relate to lack of access to big land, poor physical and institutional infrastructure and lack of knowledge on household food-resource handling procedures. Most smallholder farmers are located in rural areas where lack of both physical and institutional infrastructure limits their expansions and adaptive capacity to proper household food-resource handling procedures. Lack of access to proper roads for example, limits the ability of a smallholder farmer to transport inputs, produce and also access information which vital in promoting food security. It is apparent that markets for agricultural inputs and outputs are often missing and unreliable for smallholder farmers. Lack of assets, information and access to services also hampers their participation in potentially profitable markets.

In most cases, information inefficiencies and institutional problems such as the absence of formal markets, more so, unreliable markets are some of the constraints faced by smallholder farmers. Many of the smallholder farmers receive low prices for their products by selling them at their farm gate or local markets and therefore, compromised by brokers. Lack of human capital has also been found to be a serious constraint for smallholder farmers. They are often illiterate with poor technological skills, which is a major obstacle in accessing useful formal institutions that disseminate technological knowledge regarding food loss and waste. From the research findings in the preceding sections, the majority of smallholder farmers are not capacitated with financial, technological and marketing skills and therefore, unable to meet the quality standards of national and international policies in food production. As highlighted in the previous sections, smallholder farmers will not achieve food security status without access to financial and extension services.

Findings from the study reveal that much of the grains and other cereals harvested by smallholder farmers in western Kenya were lost

during post-harvest procedures. The grain losses occurred at all stages but more so during transportation and storage. The reasons for losses are complex and diverse as discussed in the preceding sections. Farmers' post-harvest management techniques are determined by a number of interacting variables, which have been under-researched by most studies. This study argues that much of the research has focused on other indicators of food security, with less emphasis on farmers' adaptive capacity on household food-resource handling procedures, which causes much of the food loss and waste among smallholder farmers who are not capable of managing it. It appears that the impact and extent of post-harvest losses have not been fully recognised on the institutional level, and even if recognised, not yet adequately enacted,

Most smallholder farmers in western Kenya have resorted to food exchange among themselves through the principle of reciprocity to mitigate food security. This confirms findings by Mingione (1991) that in rural societies reciprocal and distributional networks are increasingly important for obtaining food-resources in order to compensate for the weakness of competitive market resources. However, this varies across rural locales as well as by individual household characteristics, as it depends on mutual exchanges among households and the reciprocal swapping of poverty (Meert 2000).

Document analysis by the researcher has shown that since 2008, the country has been facing severe food insecurity problems. These are depicted by a high proportion of the population having no access to food in the right amounts and quality. Households are also incurring huge food bills due to the high food prices. Maize grains for instance; being staple food due to the food preferences is in short supply and most households have limited choices of other food stuffs. The current food insecurity problems are attributed to several factors, but largely due to farmers' adaptive capacity on household food-resource handling procedures. Available policies have responded to the food insecurity in the country through three major policy interventions: supply, prices and income related policies as discussed under the following sub-section.

4.1. National Policy Interventions

4.1.1. Supply Related Policies/Interventions

This involves subsidising on farm inputs, especially fertilisers, through involvement of the government National Cereals and Produce Board (NCPB) in importing and distributing the inputs, improvement of research and extension services and improving their linkages, provision of rural credit for farming such as the Kilimo Biashara Initiative (Agribusiness Initiative), improvement in rural infrastructure especially, road network, development rural

agricultural markets and agri-business skills. These interventions should be coupled with improvement of the management and use of natural resources, especially water for irrigation, permitting imports of tax free maize and ban on exports, providing farmers with planting materials and seeds, especially of the so called 'orphan crops-drought tolerant' which can be grown in the arid and semi-arid areas, encouraging diversification of crops planted and the citizens to diversify their eating habits to other foods and avoid over-reliance on maize, improving the conditions under which relief food organisations operate so as relief food can reach many needy people and private sector.

4.1.2. Price Related Policies/Interventions

This is aimed at involvement of the NCPB in the purchase of maize grains and other cereals from farmers at prices higher than market prices to provide incentive to producers, providing subsidy to maize meal millers to bring down the consumer retail prices of the maize meal (price subsidy to the consumers), raising the levels of the strategic food reserves to about 8 million bags (90kg) held by the NCPB in order to stabilise the maize grains and cereal prices.

4.1.3. Income Related Policies/Interventions

These interventions refer to the government's enhanced efforts to contribute the costs of social amenities for example, through the free education programme and reduced costs of health at public health facilities. This enables the population especially the poor to have a little more disposable income to spend on food as well as not to sell their food to meet health needs. The transfer of funds for development to the grassroots, especially the Constituency Development Fund and Local Authorities Transfer Fund, and county devolution funds help the local communities meet their development needs, while creating employment opportunities at the local level to develop specialised skills and labour of the work force. It might also contribute towards establishing producer and marketing associations for farmers to enable them to exploit their skills through collective action. Since 2008, under Vision 2030, the Kenyan Government has identified various flagship projects for implementation to achieve sustainable food security such as Agricultural Policy Reforms involving three-tiered fertiliser cost reduction branding Kenya farm produce, establishment of livestock disease free zones and processing facilities, creation of publicly accessible land registries, development of agricultural land use master plan and irrigation schemes cutting across all regions in the country.

In conclusion, western Kenya like many parts of Sub-Saharan Africa has abundant agricultural resources, but appallingly, in almost all parts of the region, thousands of people remain hungry and

malnourished. Misguided policies, weak institutional frameworks and innovations, which impact negatively on agronomic activities, harvesting and processing, food consumption patterns and above all failing markets are the persistent causes of western Kenya's food insecurity. This is attributed to longstanding discriminatory policies of national government and international institutions which neglected Kenya's rural and agricultural development in favour of urban populations who are actually not agricultural producers but consumers of what the rural population produces.

The chain of food security that cuts across the whole food supply chain comes under constant stress in a region vulnerable to the impacts of erratic weather, volatile food prices, and conflict and violence, making agricultural productivity to remain low. Where food is available, the rural poor cannot afford to buy it or are prevented from buying or trading it due to underdeveloped markets, poor infrastructure, long distances to markets and high transport fees, above all brokerage. This study quips that proper household food-resource handling procedures determine food availability and sustenance of human development.

In order for smallholder farmers to achieve the above benefits, the study recommends the following interventions: The government must more strongly and explicitly focus on institutions and relevant stakeholders on poor and disadvantaged farmers in rural areas. This could be achieved through inclusive participation and involvement in the identification, design, planning and implementation of agricultural activities with a view to improving their adaptive capacities in agricultural productions and handling process. Moreover, promoting innovation-driven activities supported by participatory research among smallholder farmers in rural areas while building on their knowledge and ingenuity is equally decisive.

References

- AFDB, 2012. Highlights of the food security situation in Africa. *Quarterly Bulletin*, Issue 3.
- Barasa, T. 2010. A review of Kenya's food security and nutrition policy. Research Workshop Proceedings, Kisumu 21, June 2010.
- Burgra, A. 2002. Political and moral implications of reciprocity networks in modern societies. *In*: F. Adaman and P. Devin (Eds.), *Economy and society: Money, capitalism and transition*, pp. 382–400. Montreal, Canada: Black Rose Books.
- Cruz, L. 2010. Responsible governance of land tenure. An essential factor for the realization of the right to food, land tenure. *Working Group Discussion Paper*, 15. Rome: FAO.

- FAO. 2014. News article: Linking farmers to moving markets. [Online] Available at: <http://kg-sps.jp/blogs/srinivas/2013/07/04/167/>. [Accessed 14th April 2015].
- . 2013. *Facing the challenges of climate change and food security: The role of research, extension and communication for development*. Rome: FAO.
- . 2011. *Global food losses and food waste — Extent, causes and prevention*. Rome: FAO.
- . 2010. Global forest resources assessment 2010: Main report. *FAO Forestry Paper*, 163. Rome, Italy: FAO.
- . 2009. *Crop prospects and food situation*. Rome, Italy: FAO.
- . 2007. *The state of food and agriculture—Paying farmers for environmental services*. Rome, Italy: FAO.
- . 2006. *Food security concepts and frameworks*. Rome, Italy: FAO.
- . 2002. *The state of food and agriculture*. Rome, Italy: FAO.
- . 2000. *The state of food and agriculture*. Rome, Italy: FAO.
- FAO, IFAD and WFP. 2014. *The state of food insecurity in the world 2014. Strengthening the enabling environment for food security and nutrition*. Rome: FAO.
- . 2012. *The state of food insecurity in the world. Economic growth is necessary but not sufficient to accelerate reduction of hunger and malnutrition*. Rome: FAO.
- FAO, WFP and IFAD. 2011. *The state of food insecurity in the world: How does international price volatility affect domestic economies and food security?* Rome: FAO.
- Gitu, W .K. 2006. Building a case for more public support. The case of Kenya. A paper Prepared for the Policy Assistance unit of the FAO Sub regional office of East and Southern Africa. *Working Paper*, 03. Rome, Italy: FAO.
- GoK, 2008. *Draft sessional paper of 2008 on food security: National food security and nutrition policy, July 2008*. Nairobi: Government Printers.
- GoK. 2010. *National economic survey 2010*. Nairobi: Government Printers.
- Gustavsson, J., Cederberg, C., Sonesson, U. 2011. *Global food losses and food waste*. Rome, Italy: FAO-UN. [www.fao.org/fileadmin/user_upload/ags/publications/GFL_web.pdf].
- Heong, K.L. 2010. *Status of the problems caused by rice planthoppers and related virus diseases in Asian rice production. Reducing vulnerability of rice crops to pre-harvest losses caused by planthopper outbreaks*. International Rice Research Institute, Manila, Philippines.

- Howard, J., Crawford, E., Kelly, V., Demeke, M., Jeje, J. 2003. Promoting high-input maize technologies in Africa: The Sasakawa-Global 2000 experience in Ethiopia and Mozambique. *Food Policy*, 28: 335–348.
- IFAD. 2011. *Rural poverty report: New realities, new challenges: New opportunities for tomorrow's generation*. Rome: International Fund for Agricultural Development.
- . 2009. Public-private-people partnerships. *Making a difference in Asia and the Pacific*, 23. New York: IFAD.
- Irz, X., Lin L., Thirtle, C. and Wiggins, S. 2001. Agricultural productivity growth and poverty alleviation. *Development Policy Review*, 9(4): 449–466.
- Kiriti, N, T. 2014. Women's experiences on food security in Kenya: Major challenges that they face. Nairobi University Repository.
- Lomnitz, L. 2002. Reciprocity, redistribution and market exchange in the informal economy. *In*: F. Adaman and P. Devin (Eds.), *Economy and society: Money, capitalism and transition*, pp. 172–191. Montreal, Canada: Black Rose Books.
- Makombe, T. Lewin, P. and Fisher, M. 2011. The determinants of food insecurity in rural Malawi: Implications for agricultural policy. *IFPRI Policy Note*.
www.ifpri.org/sites/default/files/publications/masspn4.pdf.
- Meert, H. 2000. Rural community life and the importance of reciprocal survival strategies. *Sociologia Ruralis*, 40(3): 319–338.
- Mingione, E. 1991. *Fragmented societies: A sociology of economic life beyond the market paradigm*. Oxford, UK: Basil Blackwell.
- Morris, M.L., R. Tripp, and A.A. Dankyi. 1999. Adoption and impacts of improved maize production technology: A case study of the Ghana Grains Development Project. *Economics Program Paper*, 99(01). Mexico, D.F.: CIMMYT.
- Murray, C. 2002. *Rural livelihoods: In: The companion to development studies*, Edited by Desai, V. and Potter, R.B.. London :Oxford University Press and Arnold Publishers Inc.
- Mwaniki, A. 2006. *Achieving food security in Africa: Challenges and issues*. U.S.A.: Cornell University, Plant, Soil and Nutrition Laboratory.
- NEPAD. 2002. *Comprehensive Africa Agriculture Development Programme*. NEPAD Agency, Scriptoria Communications Johannesburg, South Africa.
- Odeyemi, O.O. and Daramola, A.M. 2000. *Storage practices in the tropics: Food storage and pest problem*. , Volume 1.

- Pelmer, D.P. 2005. Agriculture in the developing world: Connecting innovation in plant breeding research to downstream applications. *PNAS*, 102(44): 15739–15746.
- Prakash-Mani, K. 2013. *Enabling food security through smallholder farming*. [Online] Available at: [Accessed 15th April 2015].
- Quisumbing, A, R. and Meinzen-Dick, R, S. 2001. Empowering women to achieve food security: Overview. A 2020 Vision for Food, Agriculture and Environment; *Focus 6, Policy Brief*.
- Sorre, B. 2014. The paradox of food insecurity in rural Kenya. The underlying socio-economic parameters in Busia County, Kenya, (*Preliminary findings*) Post Doc. Department of Anthropology, Moi University.
- . 2013. The Paradox of food insecurity in rural Kenya. The underlying socio-economic [parameters in Busia County, Kenya, Post Doc. Department of Anthropology, Moi University.
- . 2010. *Cash crop production, food security and nutrition in rural households*. Berlin: Lap-Publishing House.
- . 2005. Cash crop production, food security and nutrition in rural households. Department of Anthropology and Ecology, Masters Thesis, Moi University Kenya.
- UNDP. 2014. *Africa human development index report: Towards a food secure future*. New York: UNDP.
- . 2012 *Africa human development report: Towards a food secure future*. New York: UNDP.,
- . 2010. *Eradicate extreme poverty and hunger*. New York: United Nations.
- Wandere, D. 2009. Institutionalization and effects of seasonal hunger on the value systems of Abanyole of Western Kenya. Ph.D. thesis. Moi University, Kenya.
- Weber, M. 1958. *The protestant ethic and the spirit of capitalism*. 1st ed. Pearson Education.
- World Bank. 2011. *World Development Indicators Database*. Washington, D.C. : The World Bank.
- . 2008. *Agriculture for development: World Development Report 2008*. Washington, D.C.: The World Bank.

CHAPTER SEVEN

Institutions and Technological Innovation in Smallholder Agriculture: Lessons from *Bati* and *Kewot* *Woredas* (Districts) in Northeastern Ethiopia

Workneh Negatu

Abstract

Development of smallholder agricultural and pastoral systems is the central strategy for poverty reduction and food security in Ethiopia under Agriculture Development-led Industrialisation framework and Growth and Transformation Plan since the past fifteen years. The development of the farming systems is dependent, among other factors, on technological transformation for which appropriate institutional arrangements play a crucial role. This case study analysed the use of major agricultural technologies and issues related to market and extension institutional arrangements in fulfilling their purpose of facilitating technological innovation. The study was based on primary data and information gathered from two *woredas* (districts) in which crop farming and agro-pastoralism are key production systems. The study also presented illustrative cases of institutional misfits in the northeastern areas. The study revealed that farmers and agro-pastoralists view their demand for technological innovations in a holistic manner. They consider biological, mechanical, chemical, management/organisational technologies and knowledge, skill, risks, and market availability, while making decisions to use technological innovations. The study also showed the importance of developing sound institutional arrangements for rapid technological transformation.

1. Introduction

The critical issue of the Ethiopian economy is its laggardness to liberate millions of people entrenched in chronic and seasonal food insecurity-poverty trap. In 2003, about 14.3 million of people (22 per cent) faced critical food shortage and crisis (DPPC 2003). In 2011/12, pastoralists in southern Ethiopia were under heavy burden of drought, suffering from critical food shortage and death of animals. Often communities in lowland economic systems suffer most whenever drought-triggered food crises occur in the country.

Agricultural and pastoral systems are the main source of livelihood of rural population in Ethiopia, a very small proportion of them supported with off-farm/non-farm income. On the other hand, low crop and animal production and productivity of the agricultural and pastoral systems are considered to be the key bottlenecks of food security in Ethiopia. The problem is compounded by the absence of

or meagre off-farm/non-farm income sources. Although increasing farm production and productivity through intensification, diversification and commercialisation of farm production is a less debatable general path for agricultural growth and development, the extent and speed of these processes are low under Ethiopian context. It is now a matter of common knowledge that technological options are locally and internationally available to realise higher productivity and intensification than what the Ethiopian farmers and herders access). What is lacking in this context is effective and efficient adaptation-cum-diffusion/commercialisation of technologies (viz.. crop seeds, chemical fertiliser, crop protection methods, improved animal breeds and feeds) and appropriate and effective institutional arrangements such as markets and extension services that foster technological transformation of agricultural and pastoral systems. What is needed is more of adaptive research under the context of localities. Of course, this does not mean at all to do disregard the necessary and supportive applied and basic research. The specific objectives of this chapter are to assess constraints of use of agricultural technologies and associated institutional arrangements such as market and extension services in the context of dryland agricultural systems.

2. Conceptual Framework and Methods

The study is framed within a broad growth-oriented development perspective under which come technology and institution as the two of the four pillars of the induced innovation framework of development (Hayami 2001). The other two pillars of the framework are resources and culture. Each of the four components is broad and multilayered. Technology determines production function. Resources, institution and culture also influence production. Resources include natural, physical, financial and human resource. Social capital is another resource, which takes the form of social networking, associations, trust and norms. Institutions (rules and enforcement of rules) are either formal or informal (embedded in culture). In most cases organisations like the Extension Department of Ministry of Agriculture guide and monitor implementation of institutions. In other words, most institutions are entrusted with organisational activities and responsibilities. Culture involves social values, norms and behaviour (*ibid.*). For example, farm ploughing cannot be carried out on certain holidays among Orthodox Christians in the study areas. This study focuses on two institutions that are deemed instrumental for technological innovation. These are product market and agricultural extension. The availability of well-functioning and accessible product markets is a good incentive for farmers to adopt new technologies for the production of marketable products. Similarly, accessible agricultural extension institution that

effectively disseminates technology information, knowledge and skills about new technology to producers has a paramount importance in speeding up technological innovation.

The Study Area

The study areas are located in semi-arid zone of northeastern Ethiopia that lies on northwest side of the escarpment of Rift Valley, encompassing areas east of Debre Berhan (the capital of North Shewa Zone), west of Afar region, and passes through Shewa Robit and Kemissie areas to Bati area. Kewot and Bati (Figure 1) are the specific districts (woredas) from which the main data are collected.



Figure 2. Location of the Study Areas in Northeastern Ethiopia

Bati is found in Oromia zone of Amhara Region, while Kewot is in North Shewa zone of the same region (Figure 1). Both *woredas* are dominantly lowlands with altitude ranging between 1300 and 1500 meters above sea level.

Sources of Data

The main sources of data for this study were primary sources. The first primary source was reconnaissance survey of knowledgeable farmers and agro-pastoralists and observations of study areas, and discussion with key informants. The second type of primary source was formal household survey in both *woredas*. Structured survey questionnaire and semi-structured checklists were used for formal household survey and discussions/interviews with various stakeholders, respectively.

The key informants include agro-pastoralists, extension agents, extension supervisors and extension workers in Kemissie and North Shewa zones, Bati and Kewot *woredas*, as well as researchers, officers, and department heads at Kombolcha and Melkassa research centres. Other key informants with whom discussions were held include owners/managers of agri-businesses involved in mass production (multiplication) of farm implements and equipments, and input supply businesses.

The formal household survey was conducted on 60 farm households from each of the study *woreda* – Kewot and Bati. The sixty farm households were selected purposively from four *kebeles*¹ (15 farm households from each *kebele*), which are also selected purposively. The four *kebeles* from each *woreda* were selected on the bases of their proximity (far and near distance) to the *woreda* towns and interfacing with lowland and highland border areas. The farm households were selected on the assumption that considerable sample farmers do practice newly introduced technologies such as water harvesting, improved crop varieties, farm implements, and onion production). All *kebeles* are located in the lowland area, which is dominantly of *kola* (semi-arid and sub humid area) agro-ecology. The names and locations of the eight sample *kebeles* are given under Table 1.

Table 1. Features of sample *kebeles*

No.	<i>Kebele/woreda</i>	Number of <i>kebele</i> households	Sample size	Distance estimate (km) and location from town centre
1	Jubambana-Nfasso/Kewot	1100	15	5, South
2	Yelenena-Wacho/Kewot		15	15, Northwest
3	Mereyena-Ensertu/Kewot	1017	15	7, East
4	Sefiberetena-Hidi/Kewot	2026	15	32, East
5	Salmene/Bati	1327	15	9 East
6	Mamed/Bati	1260	15	11, Southeast
7	Ella/Bati	2084	15	32.5, West
8	Fura/Bati	2000	15	7, Northeast
	Total		120	

3. Findings and Discussion

3.1. Resource Endowments and Cropping Pattern in the Study Areas

Arable land, grazing land and livestock are the major resources of farmers and agro-pastoralists in the study areas. Fodder is not grown by any of the sample households in both *woredas*. Animals are let loose to graze pasture around the households and far away from homesteads through seasonal transhumance migration. Size of arable land operated contributes directly to crop production growth. Farm size contributes also to farm productivity by reducing overhead or transaction cost per unit area through enhancing efficiency (economies of scale). Size of farm holding in the study *kebele* in Bati *woreda* was considerably higher and in Kewot *woreda* marginally higher than the national average which is slightly less than one hectare. The Decline of farm size is the current trend in both *woredas* like the trend observed at national level. The trend of declining farm size is related with the increasing population who need farmland for agricultural livelihood activities. The number of landless households in all *kebeles* had also been growing over the past decade before the survey year because of population growth and immigration of people from different places manifest in people immigrating into Sefiberet *kebele* in *kewot woreda*). In general, it is estimated that about 20–25 per cent of households in the study *kebeles* were landless during the survey year (2006).

According to the sample survey, the average size of own farm holding of a farm household in Kewot and Bati *woredas* was

respectively 4.60 *timad*² (1.15 ha) and 6.16 *timad* (1.54 ha), with average number of parcels of 3.13 for Kewot sample and 2.70 for Bati sample farm households. Much more number of sample farm households (70 per cent) owned grazing land in Bati compared to proportion of sample farm households (20 per cent) in Kewot. The average size of own grazing land for Kewot and Bati sample farm household was 0.94 *timad* and 1.64 *timad*², respectively (Table 2). A farm household in Bati has on average larger farmland and grazing land than that of Kewot farm household. But in terms of size of livestock possession, both *woredas* do not seem to vary considerably.

Table 2. Size of landholdings of sample households, in *timad**

Item	Kewot <i>woreda</i>		Bati <i>woreda</i>		Total	
	Mean	N	Mean	N	Mean	N
Total own landholding	4.60	59	6.16	60	5.38	119
Own arable land	4.41	59	4.82	60	4.62	119
Share-cropped/rented-in land	3.83	32	4.91	11	4.11	43
Own grazing/grass land	0.94	12	1.84	42	1.64	54
Number of parcels	3.13	60	2.70	60	2.92	120

* 1 *timad* = 0.25 hectare; N= Sample size

Oxen, cows, goats and pack animals (mainly donkey and camel) were the major types of animals kept by the farm households in the Kewot and Bati study *kebeles*. Table 2 shows the livestock distribution among the sample farm households in both *woredas*. The average number of oxen and cow owned by a farm household in Kewot and Bati *woredas* (total) was 1.79 and 2.05, respectively. Camel owning households in both *woredas* were few, keeping on average 2.39 camels (Table 3).

Table 3. Livestock holdings of sample households (in number)

Item	Kewot <i>woreda</i>		Bati <i>woreda</i>		Total	
	Mean	N	Mean	N	Mean	N
Oxen	1.94	51	1.62	48	1.79	99
Cow	1.57	35	2.40	47	2.05	82
Young bull	1.12	25	1.67	24	1.39	49
Heifer	1.22	18	1.69	29	1.51	47
Calf	1.29	21	1.93	29	1.66	50
Sheep	4.59	17	5.42	12	4.93	29
Goat	7.46	28	4.38	34	5.77	62
Donkey	1.20	46	1.39	18	1.25	64
Camel	3.86	7	1.45	11	2.39	18
Chicken	5.33	52	7.23	47	6.23	99

N= sample size

A sample household in Kewot was keeping on average larger number of camels than a household in Bati *woreda*. But a large number of sample households in Bati keep camels compared to that of Kewot

woreda. Camels are highly valued animals both in exchange and cultural terms in the study areas. Oxen are also a key resource as a source of power for ploughing and threshing activities of farmers and agro-pastoralists.

Cropping Pattern

The commonly grown crops in Kewot woreda, particularly in the study *kebeles* were sorghum, *teff*, maize, and vegetables such as onion, pepper, cabbages and tomatoes. The major crops grown in Bati study *kebeles* were sorghum, *teff*, maize, sesame, fruits (papaya, mangoes, guava, etc.), vegetables (onion, cabbages, tomatoes and carrots), and stimulant crops like coffee and *khat*. While sorghum was the dominant and staple food grain for all study *kebeles* in Kewot and Bati *woredas*, onion is produced extensively with irrigation water in Kewot area during dry season (January–March) for commercialisation. Irrigated onion production is not popular in Bati *woreda*. There, the important cash crops were fruits and *Khat*.

Table 4 shows the average area of major crops cultivated on own land holding and shared-in/rented-in land parcels in the study (2005/06) cropping year.

Table 4: Mean land size of cultivated crops grown by the sample farm households in 2005/06 cropping

Crop	Kewot		Bati	
	Mean area, <i>timad</i>	Number of respondents	Mean area, <i>timad</i>	Number of Respondents
Sorghum	3.25 (1.67)	52	3.59 (2.44)	60
<i>Teff</i>	3.25 (2.62)	42	0.90 (0.74)	5
Maize	1.19 (2.62)	8	0.97 (0.95)	24
Durah (zengada)	1.5 (0.71)	2	0.50	1
Mungbean (<i>Masho</i>)	0.62 (1.19)	6	0.00	0
Sesame	0.63 (1.17)	2	0.74 (0.62)	35
Onion	1.11 (1.25)	20	0.31 (0.18)	4
Pepper	0.25	1	0.34 (0.28)	4
Millet	0.00	0	1.44 (1.74)	4
Haricot bean	0.00	0.	0.48 (0.58)	18

SOURCE: Own survey data

Note: Figures in brackets are standard deviations

As Table 4 shows, sorghum was grown by the highest number of sample farmers in both *woredas*, while *teff* in Kewot *woreda* and sesame in Bati *woreda* were the second important crops in terms of the number of sample farmers growing the crops. Both are important cash crops. Onion and maize are the third important crops in Kewot and Bati, respectively, in terms of the number of sample farmers

growing them. The land size allocated for each crop seems to vary considerably within each *woreda* (see the standard deviations shown in Table 4).

3.2. Agricultural Innovations

Agricultural innovations in the form of products, inputs and management practices, and institutional arrangements are expected to enhance the productivity, efficiency, and values of economic activities. This study analyses two technological innovations—sorghum production technology (seeds and fertiliser) and onion (new crop/product) cultivation and two institutional arrangements (market and extension arrangements).

3.2.1. Sorghum Production Technologies

Sorghum was found to be the major crop produced in both *woreda* mainly for consumption and partly for market. It covered more than 60 per cent of cultivated land of the survey sample households. It is produced on rain; and no irrigation water was supplied to sorghum or its productivity is low as revealed by key informants. Due to rain shortage and pest problem, sorghum production in some villages in Kewot *woreda* was declining. Farmers in these villages were not self-sufficient in sorghum production. In Bati, sorghum, the major annual crop was also facing various problems, the crucial problem being insect attack.

In most cases, farmers preferred traditional sorghum varieties (the white and red sorghum varieties) for they have marketable colour, and palatable and high quantity straw for animals compared to that of improved sorghum varieties. The key informants indicated that, with the termination of fallowing practice because of population growth, and the subsequent decline in soil fertility compounded with insect problem and decline of rainfall, sorghum yield has also declined significantly over a decade before 2006. In the past, it was possible to get 6–8 quintal of sorghum per *timad* (quarter of a hectare), but during the survey year it declined to a level of 3–4 quintals per *timad*. In the face of these problems, the *woreda* agriculture office was making efforts to promote in the *kebeles* cultivation of peanut and haricot bean as alternative cash crops, influencing farmers to limit sorghum production aimed for consumption. The constraints of sorghum production include shortage of water (rain), insect attack, low marketability (undesired colour) and low quality straw of improved sorghum varieties, declining soil fertility, declining yield of local sorghum seeds. The problems need research and development attention to generate and disseminate technologies that enhance productivity, marketability and profitability of sorghum production.

3.2.2. Use of Improved Seeds

With regard to use of improved seeds, only 5.7 per cent of Kewot farmers (n=53) and 7 per cent of Bati sorghum producers (n=57) used improved seeds during the 2005/06 harvest season, and the rest did not grow improved seeds. The *woreda* agricultural office was the main agency which supplied improved sorghum seeds though such seeds were rarely available in private markets.

In Kewot, a yellow local sorghum variety known as *Afeso* is preferred by most farmers during drought periods, for it matures within short period of time. The variety has good demand on the market. Other short season local sorghum varieties were *Cherekit* and *Mogayfere*. The problem with improved sorghum varieties was that they were less drought-tolerant. The other constraints were those characteristics undesired by farmers which were mentioned above. For example, an improved sorghum variety known as *Key-sorghum* had been under promotion for more than 17 years in the Kewot areas by the study year. But the variety was not well established in the areas after all this period mainly due to multiple problems. The variety's short maturing nature exposes it to the bird attack, for it matures earlier than the traditional ones. Besides, its short stature is not suitable to supply adequate straw for animal feed. Moreover, the traditional sorghum varieties have longer height, good resistance to environmental stress and provide higher amount of palatable crop residue for animals. The seeds of the traditional sorghum variety are full and red in colour, attracting higher market price.

The key informants in Kewot indicated that water shortage and pest problems discourage farmers from investing in improved seeds as well as chemical fertiliser. Risks of rainfall/crop failure and insect epidemics often force farmers to continue growing traditional seeds instead of improved seeds. This might call for climatic production and research strategies and measures to adapt to enduring problems such as drought and climate change-induced stresses.

Use of improved seeds in Bati area was insignificant. The improved sorghum variety under promotion was short maturing, but low yielder compared to long maturing local variety. Like in Kewot, the improved variety did not supply enough stalks for animal feeds and other uses. Moreover, local sorghum varieties are preferable for consumption.

3.2.3. Chemical Fertiliser Use and Management Practices

Sorghum was the third priority crop for chemical fertiliser application in Kewot area following maize, which comes after onion, while it was the first priority crop in Bati area. But, even if the Bati sample farmers expressed that their interest and priority of fertiliser application is for sorghum, they usually do not apply fertiliser to

sorghum. This is mainly due to risk of rain failure, for fertiliser is ineffective without adequate moisture.

Farm households in both study *woreda* employ mainly traditional farm management methods. They plough using oxen-drawn traditional plough (*Maresha*), sow seeds by broadcasting manually and control weeds manually. Harvesting in both study areas was done manually using sickles. Threshing is also done manually with stick and trampling animals. Although the performance of these traditional technologies are not compared with the alternative modern methods, i.e. tractor drawn modern plough, row planting, chemical control of weeds and improved harvesting machineries, the need for improvement of the efficiency of these traditional methods, developing improved farm tools and machineries appropriate for small-scale farmers' situation need to be recognised. Moreover, evaluating some of the traditional management technologies in comparison with the available and feasible modern management technologies, and upgrading these traditional technologies could be essential measures to facilitate technological change.

3.2.4. Onion Cultivation

Onion is an important newly introduced cash crop produced on irrigation extensively in Kewot study *kebeles*, and to a limited extent in Bati study *kebeles*. Red onion variety (locally known as Bombay) was introduced in Kewot area around 1999. For onion production, farmers purchase fertiliser, seeds, insecticide and hire labour for land preparation, planting, weeding/cultivation and harvesting. Some farmers who live far from rivers do hire motor pumps to extract water from boreholes. Pests and deteriorating soil fertility were crucial problems identified by the key informants. The key informants also pointed out that onion seeds bought from traders are impure and of low quality, contributing to low level of onion productivity. Low storability of onion forces farmers to sell onion immediately after harvesting for low price. On the other hand, traders who come to farm gate through brokers pay low price to onion, rendering the profitability of onion production less than the expectation. The discussion revealed that traders are forcing farmers to squeeze 120–130 kilo of onion into a sack for a price of 80 kilos, undercutting the price immensely.

Onion production was not common in Bati *woreda*, mainly due to poor productivity and lack of market access. Bati producers benefit more from fruit production (papaya, oranges, and mangoes) and vegetables like cabbages, tomatoes, carrots etc, for which there are good markets at Bati, Logia, Dubti, and Asaita. Moreover, shallot was much preferred by consumers in Bati market compared to onion. No trader comes to Bati to buy onion, but to buy fruits. Since the demand for fruits is higher than for onion, farmers incline to fruit

production on irrigation, gradually abandoning the limited onion production. This simply reflects the importance of marketability in the production of cash crops.

3.2.5. Water Harvesting and Irrigation Practices

Irrigation production has been promoted in both *woredas* since recently. Pond-based irrigation in Kewot area started in 2004. The irrigation promotion was aimed at increasing production of commercial crops like onion, Avocado, papaya, mango, guava, orange, sugar cane, pepper, tomatoes, cabbage, beetroot, carrot and khat. Although the major use of irrigation water is for vegetable and fruit production, a few farmers use the water for: supplementary irrigation to cereal production, drinking water for humans and animals and for production of forage grass on small portion of farm parcels located near to rivers or water resources.

Irrigation water sources in both *woredas* were rivers by diversion or harvested water from watersheds using ponds, done mostly on the basis of food for work and other projects. Power sources used to pool or harvest water from the sources include manual (human power), gravitational power, pedal pumps and motor pumps. Different organisations were involved in the promotion of irrigation, including woreda agriculture office, Tobacco Company located in Shewa Robit town, and Amhara Development Organization. The study *woreda* informants estimated that about 15–20% of the households in the study *kebeles* employ irrigation for crop production. Many of the farm households who produced on irrigation used water diverted from different rivers and streams.

There was no much use of pond-based water harvesting in the study *kebeles* of Kewot *woreda*, mainly due to scarcity of streams, the poor water holding capacity of the sandy soils of most farmlands, and the hot temperature that aggravates evaporation of water collected. Farmers who attempted irrigation on pond-harvested water did not sustain the practice mainly due to the poor water holding capacity as a result of cracking cemented ponds, torn geo-membrane (by mice and stones) used to cover floors and walls of ponds, high evaporation, drudgery of pooling water manually, and small amount of water harvested. Pond making for harvesting water was thus declining because of high costs incurred in terms of labour and cash in relation to the benefits they would accrue from the harvested water.

The water volumes of rivers used for irrigation often decline after January, causing conflicts among the water users. Some farmers bought water pumps to use underground water by digging boreholes. Farmers also exerted a lot of efforts to make irrigation efficient through group water management body. For instance farmers in

Salmene *Kebele* in Bati formed water management group (each comprising members of 40–53) that allocates water for each fruit-producing member once per month. But soon the farmers faced insufficiency of water for irrigation, for the watering frequency was inadequate. In order to resolve the problem, some farmers who afforded to buy motor pumps (mainly remittance receivers) irrigated their crops as frequently as they wanted. Some borrowed money via *woreda* agriculture office to buy water pumps. Other farmers formed groups of two or three households and bought motor pumps for group use. The pumps made possible for the pump users to irrigate their farm as frequently as they would require. However, the solution was not free of problem, for soon the water volume of the river declined and farmers without pumps faced much more water shortage, and were subject to confrontation with pump owners. As indicated by the informants, farmers with motor pumps got large share of benefit from irrigation compared to those irrigation farmers without motor pumps. This situation flags the importance of having a sound institutional arrangement to use water resources in a sustainable manner without conflicts. Evidence gathered from this practice is that pumping water from the same river from different directions without programming and regulating would result in unsustainable irrigation practices.

3.3. Institutional Arrangements and Services

Institutional arrangements are required to rule transaction and create incentives to facilitate equitable and efficient use of resources, technological innovation and economic growth. Transaction between individuals or groups of people can take place mediated by the traditional culture and norms as well as through formal markets. Institutions that rule and stimulate input and output markets facilitate social and economic relations and transactions. Physically and economically accessible markets are important incentives for better production and technological innovation. Well-organised and structured institutional arrangements for delivery of extension and advisory services to farmers and agro-pastoralists would also enhance agricultural and agro-pastoral systems in terms of production, productivity, and technological progress. This section focuses on the analysis of the situation and practices of market and extension institutions in relation to their roles in technological progress and economic growth. It also highlights institutional constraints that hinder technological progress.

3.3.1. Sorghum and Onion Markets

Sorghum is produced mainly for consumption. Sorghum productivity has declined over the past years due to rainfall shortage, pests and soil fertility deterioration. As a result, limited amount of sorghum was supplied to nearby markets or town markets by the producers.

The major and the biggest market in the Bati *woreda* is Bati town market which is visited by many farmers, agro-pastoralists and pastoralists from neighbouring lowland and highland areas. The market was not however attractive for sorghum, compared to that for Khat (a stimulant cash crop). There are also small local weekly markets. Farmers also visit town markets located in neighbouring *woredas* like Gerba and Degan *woreda* town markets).

Shewa Robit is a market town for Kewot *woreda* and neighbouring areas. Traders in Shewa Robit market used to buy onion only in sack units regardless of the weight. Since onions have to be sold after harvest, farmers are faced with a very weak bargaining power in the face of the traders, for they have no options other than dumping (farmers say that onion after harvest is like dead person (*kareza*), for it is easily and quickly spoiled). In order to strengthen their marketing position, the farmers have organised themselves in farmers' cooperative union, named Yifat Union through farmers cooperatives of Kewot, Efrattana Gidem, Antsokia and Tarma Ber *woreda*. The Yifat Union also supplies seeds and chemical fertilisers to farmers, in competition with Ambassel, a para-political party business organisation. The Union was then at its infancy stage to strongly compete with private traders. Key informants claimed that the Union has potential to improve market conditions, fairness of marketing practices and control mal-trading practices of merchants, implying the need for institutional efforts to strengthen the organisational performance and competitiveness of the Union.

3.3.2. Agricultural Extension Institution

The extension department at *woreda* level provides extension service and training to farmers. Extension services were on delivery in the form of family package that comprises provision of packages of technological inputs and associated advisory services such as production of small animals (shoats and poultry), use of improved beehives, seeds and implements (such as tie-ridger and Broad Bed Maker—BBM) to defined groups of farm households. The extension workers and leaders argue that the approach was not effective enough to bring changes. The reasons for the ineffective extension approach are multifarious, as indicated by the discussants. The service delivery program was a form of top-down imposition (from regional and zonal offices of agriculture to farmers and development agents) without consulting them. All planning and programming activities imposed from the top did not often take into account priorities, demands, problems and circumstances of the farmer communities at grassroots. Moreover, the intervention of local administration officials was high. Since extension workers were pressed to implement some administrative and political works among farmers, they were not greeted with enthusiasm by farmers. Farmers listened

to information and advice from development agents with reservations. The following cases illustrate institutional issues related with technology transfer.

Case 1: Agricultural Strategy and Extension Service

A group of experts and officials designs agricultural development interventions for a region or sub-region. For example, household package programs for the study areas were designed by Amhara Regional Bureaus. Accordingly, livestock production was assigned as specialisation activity for the eastern Amhara region. A fixed number of households were incorporated in a specified household package program (cattle fattening, bee-keeping, shoat production, etc). Agricultural extension workers were then instructed to come up with certain population of farm households for the specified program. This was done in order to fulfil the planned target by the regional bureaus, without real assessment of the needs and interests of the farm households. Then farmers were asked to take the package for a given amount of loan (e.g. beehives for 450 Birr per each). Many farmers however refused to take for example beehives and tie-ridgers in Kemissie area on loans. As a result, the *woreda* offices were forced to store or damp the equipments in their own stores and/or in stores of other organisations like Technical and Vocational Education and Training. Similar experience was also observed in North Shewa. In 2004, the Amhara regional bureaus planned and supplied 17,000 BBMs. But for lack of demand from farmers, most of them were stored or damped in compounds of agricultural offices and other *woreda* offices. Again in 2005 other 13,000 BBMs were planned and supplied by the region mostly to be damped like in the previous year. The Regional Bureau was not able to respond to feedbacks from the zone and *woreda* agricultural workers and the situation at grassroots. In this context, the aim of the Agricultural bureau was to fulfil the quantity plan of production and supply of equipments, relegating the work of distribution of the implements to farmers as the responsibility of the *woreda* offices. In this case, the *woreda* offices relay the instruction and plan of distribution of the implements to the development agents (DAs) of *kebeles* in order to fulfil the plan prepared for them. The DAs, in turn instruct *kebele* leaders and *Mengistawi Limat Buden* (Governmental Development Group) leaders at *gott* (village) level to recruit farmers for the program who would take the household package. The *kebele* and *gott* leaders have to fulfil the given plan by imposing on individual households in the *gott*. In this situation individual households would take the package or reject it. This is a chain of fulfilment of quantity plans without bothering much about the needed development and impacts in yields, production and income. All these efforts were largely in vain, since the program was not based on real circumstances and demands of farmers. The ultimate result of all this effort was indebting farmers

with huge loan that cannot be repaid by the households, finally creating tension between farmers on one side and extension workers and government on the other side, causing potential distrust in future developmental intervention. These institutional arrangements are simply misfits that retard technological transformation process and growth.

Case 2: Extension Method

Discussion with agriculture personnel and experts of Semien Shewa and South Wollo zones pointed out that before 1994 on-farm demonstrations were conducted on 10 x 20m plots on selected model farmers in order to demonstrate and create demand. With the advent of SG-2000 program, demonstration activities continued on a limited number of farmers (20–30). The program was one of providing inputs (e.g. seeds and fertiliser) on a credit with 50 per cent down payment, the rest being payable after harvest. For instance, the demonstration on a quarter of a hectare done on 40 farm households in Menz highland by the SG-2000 program registered an average yield of 35 qt of wheat per hectare in 1994.

Later a new extension approach (copy method) was introduced, arguing that demonstration on limited pilot farmers does not cover the farm population sufficiently. The new approach was forged with the aim of addressing all farmers of *woredas*. This copy method of extension was introduced in such a way that a chain of farmers will be involved in copying technology package from key contact farmers. This method requires that the package should be complete enough and that each farmer applies the package fully. But such method proved to be ineffective, and hence was replaced by the latest approach under use during the study year. This is an extension method based on governmental development group and incorporated cells. Each group on average comprises 35 farm households organised in seven cells, each cell composed of five members. There was no demonstration or skill training in this approach. It was carried out through lecturing/informing cell leaders on different agricultural technologies and practices, on the assumption that each cell leader transfers the knowledge to other cell members. This approach was initiated in 2004 and has been spreading since then. But the discussion with the key informants revealed that this approach was once again found to be ineffective and unsustainable in generating the envisaged technological change, for it was too theoretical without adequate demonstration, skill training and piloting on different technologies and skills (e.g. water harvesting, feed preparation, and use of improved seeds). In many instances, the farmers' knowledge and experience was more valid than the recommended practices. For instance, a research recommendation of Urea-DAP application ratio in Jiru area had been 1:1, while farmers practice was at 1.5:1 Urea-

DAP ratio. Later, agricultural extension and researchers confirmed that the farmers' practice was more effective and acceptable than their recommendations.

The lesson gathered from these extension practices was that extension methods/approaches are frequently changed even without assessing their failure or success thoroughly. Extension approach and institutional arrangements were made in an ad-hoc manner, without detailed studies and adequate discussion and planning process with relevant stakeholders, particularly farmers and development agents. Plans, usually quantities of technological inputs to be distributed (e.g. number of tie-ridgers, BBMs and quintals of improved seeds), were relayed from top-level offices (e.g. regional and zonal offices) down to grassroots bodies (woreda offices, DAs and farmers), irrespective of the demand, interest and constraints of the end users – the farmers.

Case 3: Contract Arrangement and Rule Enforcement

An important institutional problem observed was absence of appropriate linkages among agricultural development planning and administration bureaus, research centres, extension workers and agribusinesses involved in technological implement/input multiplication, input and credit supply, and product markets. This can be illustrated with a case of improved mechanical technology - tie-ridger.

After the Kombolcha Research, Multiplication and Promotion Centre tested and recommended prototypes of both BBM and tie-ridger for mass production and dissemination to farmers, private businesses (metal work businesses) were encouraged to produce the implements through facilitating loans to them and engaging them in contract agreement with Regional Bureau to produce specified number of the implements for distribution to targeted *woredas* and *kebeles*. The assumption was that there is demand created with farmers and that they would buy the implements on loans. The firms were supposed to multiply or manufacture the implement according to specifications offered. The Kombolcha Research, Multiplication and Promotion Centre would then inspect and certify the standard of the manufactured implements in reference to the prototype specifications.

The Regional Agriculture and Rural Development Bureau was then *bound* to pay the firms according to their agreement and distribute the implements to targeted *kebeles* through zonal and *woreda* agricultural offices. This agreement reached between the Bureau and the private micro-enterprises was not however known to the *woreda* offices and the targeted farmers. Farmers' role was passive since they were not directly involved individually or in-group on the decision of the required quantity of implements.

In between, conflicts arose between the Regional Bureau and these firms on the fulfilment the specifications according to the bilateral agreement reached. The crux of the dispute between the implement manufacturing micro-enterprises and the Bureau was the Bureau's unilateral change of the specification and contract points without consulting the research centre that provided the prototype specifications. The entrepreneurs did not appeal to courts whose mission is to resolve any contract-related disputes, claiming and complaining that their previous experiences have convinced them that courts are no longer neutral as stipulated in the law. Moreover, the court proceedings are bureaucratic and costly, thereby, affecting their micro-investment activities with their limited capital. Moreover, all these odds, lack of trusts and irregularities may open windows for rent-seeking individuals involved in contract giving and contract enforcing activities

All these inconveniences and irregularities show the absence of need assessment before developing, producing and supplying the technologies. It also illustrates the absence of effective technology development policies, planning and governance. And such institutional irregularities and inefficiency would ultimately retard the process of development and dissemination of appropriate technologies.

6. Concluding Remarks

Technologies like tie-ridger, improved plough, animal- drawn trailer, wheelbarrow, improved seeds and fertiliser, irrigation implements and structures and beehives have been under promotion to farm communities in the study areas. Extension workers are engaged in the promotion of these technologies and advisement of farmers. These technologies are developed by national and regional research institutes, but mostly without first identifying priority production problems and constraints or without full knowledge and assessment of the need and demand of the users. There have been no thorough and consistent background studies to identify and prize farmers' problems with regard to desired technologies to be developed and disseminated.

This study reveals that farmers do have a holistic view of their demand for technologies in their farming system. They look at technology types (biological, mechanical, chemical, organisational/institutional) they think are relevant, knowledge and skill they possess, risks they may face, and market availability for their products and their access to inputs in their decision of agricultural innovation and activities they undertake. This situation implies that research system needs first to identify priority areas, look for technological solutions from the available stock within the

country or outside. The technologies need to be pilot-tested and evaluated on-farm, followed by demonstration of the technologies after their feasibility is assessed and ascertained with farmers' participation. On-farm assessment needs to incorporate both economic and social dimensions, including profitability, cost-saving, technical efficiency and input availability and affordability.

An important measure required in connection with technical feasibility is strengthening and promoting efficient and effective institutions and agro-businesses that provide all the necessary services for technological transformation. Moreover, institutions such as market, extension service, policy and program planning bodies and rule enforcement arrangements which are expected to foster effective technological change and ultimately enhance productivity and profitability of smallholders require much improvement and articulation. It is only when both technological innovation and effective-cum-efficient institutions work hand-in-glove that sustainable technological innovation, agricultural development and food security are ensured.

Notes

1. *Kebele* is the lowest administrative unit below district (*Woreda*).
2. *Timad* is a local unit of farmland size based on how much can be ploughed per day with a pair of oxen. A *timad* is equivalent to about 0.25 ha.

References

- DPPC (Disaster Prevention and Preparedness Commission). 2003. Update on current food situation and additional food requirements. Special Early Warning System Report, Addis Ababa, 24 April.
- Hayami, Y. 2001. *Development economics: From the poverty to the wealth of nations*. 2nd ed. Oxford University Press.

CHAPTER EIGHT

Land Tax and Sustainable Use of Land for Food Security in Post-Land Reform Zimbabwe

Peter MacKaye

Abstract

At the turn of the current Millennium, Zimbabwe embarked on a riotous land reform programme that saw the transfer of land from the large-scale (white) commercial farmers to the newly resettled black farmers. Given the manner in which the reform programme embarked, food security for the country was one of the casualties of that land redistribution. Among other causes of food insecurity are multiple farm ownership coupled with inefficient utilisation of the land, lack of working capital of infrastructural development on the farms and insecurity of tenure attendant to the 99-year leases. To attack multiple farm ownership and stimulate efficient use of the country's land resources through rightsising farms, the Ministry of Lands and Rural Resettlement has proposed a land tax of US\$1 per hectare per month. This paper analyses the land tax in the context of the desire for sustainable use of the land to achieve food security in Zimbabwe. It discusses the merits and demerits of the proposed land tax. The backdrop to this proposed land tax is brought to the fore. Drawing on secondary sources and interviews with participants in Zimbabwe's agricultural revolution, the writer argues that the proposed commercialisation of land could be the panacea for the food security challenges of the country provided that it is complemented by an array of other interventions. Success of the land tax and sustainable land management for food security in post- land reform Zimbabwe will hinge on the government's commitment to guarantee security of tenure and support investment in the farms. Financial resources from the land tax should indeed be used for infrastructural developments on the farms and requiring simultaneous redressing in the bankability of the 99- year leases. Those overburdened with the tax are bound to release excess land to other land seekers and increased production and productivity on the new farms will increase economic activity down the value chain. Thus, the land tax, used in conjunction with other interventions, could result in sustainable use of land and achieving food security for Zimbabwe.

Keywords: land tax, sustainable use of land, multiple farm ownership, food security

1. Introduction

At the turn of the 21st century, Zimbabwe adopted a major land reform programme that saw the transfer of land from the mainly white commercial farmers to the black majority. That reform programme led to the resettlement of over 100,000 families on newly resettled farms comprising A1, targeting the smallholders, and A2 earmarked for the more capitalised farmers. The basic reasons behind this large-scale land reform have been a matter of intense debate among academics (Mamdani 2008; Ranger 2009; Sachikonye 2004) to mention but a few. This paper will not delve much into that debate because it is an issue that has already received detailed analysis. The point of departure for this paper regards how to tackle the various sustainable development challenges confronting the nation as a result of the reform programme. Upon carrying out this unprecedented land reform programme in Southern Africa, if not the whole of Africa, Zimbabwe faced a myriad of challenges. The Zimbabwe Democracy and Economic Recovery Act (ZIDERA) of 2001 came into being, bringing with it targeted sanctions on the country's leadership. Balance of payments support from the international multilateral agencies also dried up with the enactment of ZIDERA. Had it not been for the BOP support and development assistance, the economic growth of the country would have had stagnated if not regressed. The land reform programme was premised on the one man-one farm policy but unfortunately some greed elements in society grabbed much more, a point acknowledged by the Utete Land Report (2003) which was prepared after a Presidential Commission of Inquiry into the Land Reform Programme in Zimbabwe. The speed at which the reform programme unfolded sacrificed food security of the country. Infrastructural development that was supposed to follow the reform exercise has all but remained an elusive goal. In the current 2014/2015 agricultural season, the country has to import about 1.400 000 tonnes of maize the staple food because in the context of very limited irrigation agriculture a mere 500,000 tonnes of grain were realised due to inadequate rain (www.newsdezimbabwe.co.uk/2015/04/01). Against that backdrop and motivated by the desire to attain sustainable economic development premised on agriculture, the Ministry of Lands and Rural Resettlement has proposed a land tax of US\$1 per hectare per month. This paper analyses the merits and demerits of the proposed land tax. The paper gathers the views of some of the protagonists in Zimbabwe's agricultural revolution with regards to how the land tax will stimulate agricultural production and investments on farms and concludes with a recommendation that may enable the country to achieve sustainable use of the land and food security.

1.1. Background and Literature Review

Zimbabwe has been grappling with the land question for a very long time. After independence, the post-colonial state inherited a skewed distribution of land that had its roots in the racially biased land distribution and tenure systems of the colonial era. The 1894 Order in Council, the 1896 Order in Council, the Land Apportionment Act of 1931, the Native Land Husbandry Act 1951 and the Land Tenure Act 1969 had individually and collectively created racially skewed distribution and ownership of land. In the wake of independence from the yoke of British colonialism, 39 per cent of the land was owned by about 4,500 white commercial farmers who owned most of large scale farms while black communal areas occupied about 42 per cent of the land in the country (Bowyer-Bower and Stoneman 2000). It was this uneven distribution of land ownership that the post-colonial state sought to correct but constitutional provisions and lack of funding undermined the state's capacity to deliver (Moyana 2002). For instance, by 1985 when about 162,000 families were targeted to be resettled, a meagre 52,000 were resettled (Mandaza 1987). A number of scholars have dealt with issues that concern this early independence period and have aptly highlighted the constraints that scuttled the government's ability to deliver on the promise of land (Moyana 2002; Masiiwa and Chipungu 2004; Moyo and Matondi 2008).

Dissatisfied with the slow pace of land redistribution the government then adopted the neo-radical approach to the land question in the form of the 1992 National Land Policy (NLP) which had four major objectives namely, to ensure equitable and socially just access to land, to democratise land tenure systems and ensure security of tenure for all forms of landholdings, to provide for participatory processes of management in the use and planning of land, and to promote sustainable and efficient use and management of land (GoZ 2002, 2). It can be noted that the NLP was crafted around the provisions of the 1992 Land Acquisition Act which granted the state authority to acquire derelict land and under-utilised land, multiple-owned land, foreign-owned land and private farm properties that were adjacent to communal areas (Ngwenya 2014). Farmers would not be compensated for derelict land but would be compensated for non-derelict land. According to Logan (2006) cited by Ngwenya (2014), the broad philosophy underlying the NLP had two major pillars, namely, to achieve land equity through policy mechanisms and to maintain agricultural efficiency through market mechanisms. Since the above would be achieved by revoking the Provisions of the Lancaster House Agreement which had effectively protected the interests of the white farmers, but led to the collision of the state with the Western funders. Thus Phase 2 of land distribution in Zimbabwe was to be characterised by tension between the state and the West

which interpreted the country's fast track land reform as expropriation and failure to respect property rights.

Among other things the tension between Zimbabwe and the Western powers was heightened when the Labour Party in Britain, upon assumption of power in 1997, reneged on an earlier undertaking by the Margaret Thatcher-led Conservative Party to pay for land reform in Zimbabwe. The communication cancelling funding to the Zimbabwean government was done by the then Secretary of State for International Development, Ms. Claire Short, who clearly stated that the British government did not have any obligation to fund the change of hands of land in Zimbabwe as historically enshrined in the Lancaster House Constitution of 1979. It was this abrogation of commitments by the British government that was used as a *casus belli* by the Zimbabwean government to unleash hordes of landless masses onto the white held commercial farms arguing that they would not pay any compensation since the land had been illegally acquired in the first instance. Government position was that it was only going to pay for improvements undertaken by the White land owners on the farms. To give a legal facade to its actions government in May 2002 promulgated the Land Acquisition Amendment Act which empowered it to identify and acquire farmland with or without the consent of the owners (Chitsike 2013). Thus the dice for a violent take – over of commercial farms in Zimbabwe by the landless blacks had been cast.

Social movements began to agitate for greater speed in correcting the racial imbalances in land distribution. There was a convergence of pressure from landless social movements like the Svosve villagers and a state desire to boost its waning political fortunes by playing its traditional trump card— the land question. With tacit government approval social movements invaded farms, some designated for compulsory acquisition and some undesignated. Youths, war veterans, women and other interest groups would violently evict the former white owners from their farms, sometimes, looting their property in the process. The manner in which the reform exercise unfolded and the role of different interest groups in that is a matter that has been well covered by a number of scholars including Sadomba (2008) who examined the role of war veterans of the second liberation struggle in the land reform exercise.

The violent occupations gathered even greater momentum after the government of Zimbabwe had ratified the Constitutional Amendment No. 17 in September 2005. This amendment vested ownership of certain categories of land with the government and eliminated the Zimbabwean courts' jurisdiction to hear any challenge to the land acquisitions (www.mikecampbellfoundation.com/page/campbell-case-decisions-by-sadc-tribunal.10/04/15). Encouraged by this legal

instrument, war veterans and other militia occupied farms that had been targeted for acquisition by government. In some cases, whites who resisted expropriation of their lands had their homes and property burnt down.

Fast Track was aimed at identifying no less than five million hectares of land for compulsory acquisition in order to resettle the landless masses. Targets set for the initial three years were one million hectares and they wanted to resettle 30, 000 families (Masiwa and Chipungu 2004, 11). It aimed at accelerating the planning and demarcation of acquired land and to provide limited basic information and farmer support services to the resettled farmers. By the end of the official cut off point for *jambanja* a total of 134, 452 farmers (127, 192 under A1 and 7260 under A2) were given land. This large scale land redistribution exercise has generated intense debate among scholars and development practitioners. One cannot deny that the land reform exercise in Zimbabwe is a subject that has exhibited considerable polarisation in scholarship.

One of the major apologists for the land reform programme in Zimbabwe is Moyana (2002) who revised his 1984 publication of the *Political Economy of Land in Zimbabwe* to include sections that are historically rooted to provide a justification for the FTLRP. Another international scholar who supported Robert Mugabe's land policies and approach to rural development is Mahmood Mamdani. Citing Mamdani (2008), Mabhena (2010, 3) says Mamdani contends that 'far from being a crazy despot bent on undermining the national economy and impoverishing the people of Zimbabwe, Robert Mugabe had successfully corrected long-standing colonial imbalances in the rural economy and extended democracy and popular participation in the society and economy'. It is possible to say Mamdani (2008) was at once right and wrong. He was right in that one cannot really understand Mugabe outside the socio-economic and political system in which he grew up and sought to change. Given that he had grown up and fought an unjust system that entrenched racialism, Mugabe might be justified in supporting the land reform programme that aimed at equitable distribution of the country's major natural resource—the land.

On the other hand, Mamdani (2008) can be said to have exonerated Mugabe when in actual fact the President manipulated land hunger in order to perpetuate his hold onto power at any cost. Land redistribution, rather than deepening democracy as Mamdani postulated, in fact brought authoritarianism to the fore as hordes of war veterans and other ruling party functionaries were unleashed onto the farms. They were to punish the white farmers who had campaigned for the No vote in the referendum of February 2000 and also to insulate the commercial areas from the reach of the emergent

Movement for Democratic Change. Ranger (2009) is even more forthright in his critique of Mamdani when he contends that Mugabe had enjoyed a widespread support in the rural areas is erroneous because it was paradoxically in the rural areas that some of the worst violence occurred. The killings and general lawlessness on the farms in the run up to major general and presidential elections since 2000 cannot be viewed as deepening democracy. At some point, even the rule of law had been overthrown (Madhuku 2004) when the executive did not want to implement court judgments that called for the evictions of land occupiers from the farms because they were not in their favour. All these points are proof enough that Mamdani's exoneration of Mugabe's hand in the land reform programme is unjustifiable.

While earlier publications tended to be obsessed with explaining this large scale land reform programme (e.g. Moyana 2002) and the processes involved (e.g. see Sadomba 2008), recent scholarship has been concerned more with the results of that phenomenon (Scoones *et al.* 2010; Nyawo 2012). Upon realising that Fast Track had quite a number of loopholes, the government has now embarked upon corrective measures which would hopefully curb some of the challenges attendant to that process. For instance, the need to establish infrastructure on the farms, mechanisation of the farms and right sizing the farms are the critical issues that have captured the attention of the government. The sequel of this large land and agrarian reform has thus received a critical attention of scholars and practitioners one of which is the present researcher.

1.2. Challenges Emanating from Land Reform

Despite the thumbs-up from the renowned Oxford scholar, Ian Scoones *et al.* (2010), the reform exercise generally had faced challenges. The failure to respect property rights through lack of compensation for improvements the farm owners had done, a point noticed by the Land Acquisition Act (1992), aroused international condemnation of the process. Ultimately sanctions were imposed on the country, for instance, through the US authored ZIDERA. Other Western nations also imposed sanctions on the country through travel restrictions. While some interpret the sanctions as being occasioned by the anti-imperialist stance of President Robert Mugabe, it might stand to reason to argue that they were caused by the failure to respect property rights. The Land Acquisition Act (1992) provided for the payment by government of improvements made on the farms by the farm owners. This Act was premised on the fact that the white land owners had inherited the land from their forefathers who had not paid for that land but had in fact expropriated it from its legitimate owners. So the government position was that it would pay only for improvements on the land like irrigation, infrastructure, houses etc.

and not the land itself. Ironically, however, the government failed to respect its own law by evicting the farmers without compensation. Thus the legality of the reform programme has remained a contentious issue. The Mike Campbell case illustrates how the land issue has remained a thorny issue in Zimbabwe's recent land and agrarian history. Campbell who in 2004 had secured a protection order from the High Court was eventually forcibly evicted from his Mt Carmel farm in Chegutu despite the Southern Africa Development Community Tribunal's ruling regarding the illegality of the expropriation of his land (www.mikecampbellfoundation.com/page/campbell-case-decisions-by-sadc-tribunal.10/04/15).

1.2.1. Food Insecurity

Food security is *generally* conceptualised as a situation when all people at all times have adequate food in balanced nutrition, while the absence of the above is generally regarded as food insecurity. Food security is important for the good health of the nation because with food security development can occur. For many successive years since 2000, with the 2013/14 agricultural season as an exception, food security has remained an elusive goal in Zimbabwe. A number of explanations could be provided for this failure. A number of the experienced and capitalised farmers were pushed off the land and substituted by the new and absent landlords. Undercapitalisation has remained a major feature of many of the new farmers. The lack of bankability of the 99- year leases and the Permits of the A1 farmers have not helped much to attract funding from financial institutions. Security of tenure is also an unpredictable issue on the farms that changing farm ownership has become the order of the day. The supposed security from the 99- year lease is none- existent. Security is best guaranteed by political "correctness". The current attempts by the ruling party functionaries to acquire farms belonging to expelled former ministers like Didymus Mutasa in Manicaland and Kudakwashe Bhasikiti in Masvingo (www.newdzezimbabwe.co.uk 03/06/2015) show that 99- year leases do not necessarily guarantee security of tenure. The two were expelled from government and the ruling party Zimbabwe African National Union–Patriotic Front, alongside many others, for allegedly siding with the former Vice President, Joice Mujuru who is accused of having tried to illegally dislodge Mugabe from power. Infrastructural development on a number of farms is still a far cry from the required levels. Roads, schools, health centres and housing facilities are not well developed. The net effect of all these factors combined has been to undermine agricultural production and productivity that the country has deteriorated from the bread basket of the region to a begging bowl. The late historian, Terrence Ranger

thus describes the reform exercise as “the best example of how not to carry out a land reform programme” (Ranger 2009).

1.2.2 Multiple Farm Ownership

Premising the land reform exercise on the one man – one farm policy was meant to ensure equitable land distribution and sustainable utilisation of the land so that it would have swinging linkages with the other economic sectors. Sustainable use of the land was meant to unlock its maximum value and contribute to wider national economic growth and development through increased activities down the value chain. Suspecting that this noble policy might have been flouted by the big fish and worried about declining production, President Robert Mugabe commissioned the Charles Utete-led committee whose terms of reference included investigating into Zimbabwe’s recent land reform programme. True to his suspicions, Utete (2003) confirmed that the one man – one farm policy had been flouted and recommended attention to it. The case of one former Governor of Mashonaland West is well documented as a symbol of virtual fiefdom established by someone in the corridors of power. What has to be bemoaned is the fact that the multiple farm ownership has not resulted in increased agricultural production and productivity. Unfortunately, the Utete Commission (2003) did not come up with a remedial recommendation.

1.2.3. Lack of Infrastructure on the Farms

Undoubtedly, infrastructural development is necessary on the farms. This includes roads in order to transport produce to the market, accommodation for the employees, clinics for their health care, schools for the education of employees and their children as well as irrigation infrastructure in order to irrigate crops in the context of erratic and unreliable rains. It is contended by Cypher and Dietz (2004, 353) that without education agriculture cannot move forward. This is because to practise agriculture one needs to be agriculturally literate. Agriculture needs an educated workforce among others for bookkeeping and balance accounts. Inputs and chemicals need to be applied in time and adequate quantities. These are operations that require a bit of literacy/education. Irrigation infrastructure in some instances was vandalised by the departing white farmers who were evicted against their wishes. It has become too expensive to re-install that infrastructure. In general, it is no exaggeration to conclude that the infrastructure on the post- land reform farms is far less serviceable.

2. Conceptualisation

Three operational phrases shall be conceptualised here. These are land tax, sustainable use of land and food security. Land tax is

defined as a levy that is imposed on unimproved land. It is an ad valorem on land that disregards the value of buildings, personal property and any other improvements on the land (Whittaker 1914). This is the value the land would have in its natural state with no buildings, no landscaping and so on as postulated by Henry George (1879). In the case of this land tax under focus, it is based on a valorisation that is arbitrary and does not vary according to natural endowments. It is given as US\$1/hectare/month (*The Herald*, 10 January 2014). Since the publication of the Brundtland Commission Report (1987), the concept of sustainability has been gaining considerable currency. Sustainability is defined as utilisation of land resources in order to meet the needs of present generations without compromising the ability of future generations to meet their own needs (UN WCED 1987). This involves using the land optimally and responsibly so that the land does not fall victim to land degradation but continues to be productive. So use of the land in a sustainable manner ensures that the land is not prone to degradation, and its utilisation meets the needs of the both the present as well as future generations. Food security is said to be existing, “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” (FAO 1992). Distilled to its simplest form food security requires three basic pillars to be present concurrently: food availability, food access and food use. Food availability should be accompanied by affordability of that food. Food use revolves around issues of basic nutrition and care as well as issues to do with water and sanitation. It is the desire of all countries and leaders to ensure food security for their citizens.

2.1. Theoretical Considerations

This study makes use of two interrelated frameworks. It makes use of the Smyth and Dumanski (1995) framework which is otherwise called the Framework for Evaluation of Sustainable Land Management (FESLM). According to this framework, the farm should be seen and regarded as an ecologically sustainable unit. This becomes necessary against a backdrop where the twin challenges of environmental degradation and population growth have led to a rethink in land management practices, short of that future generations ability to derive adequate food supplies from the current farmlands would be undermined. This framework says that an assessment of sustainability can be achieved by comparing the performance of a given land use with the objectives of the five pillars of sustainable land management namely: productivity, security, protection, viability and acceptability (Smyth and Dumanski 1995, 402). There is a growing awareness of the fact that the Earth’s arable land resources are finite, despite the needs of future generations. In the future, it would be difficult to meet the food requirements of the population because, among other things, the leeway to open up new lands for

production such as can be done now would not be available. Therefore the thrust is now towards sustainability which is in this context defined as a measure of the likelihood that a particular land use will remain physically, economically and socially suited to a particular location for a significant period of time. In the context of the FESLM, sustainable land management combines technologies, policies and activities aimed at integrating socio-economic principles with environmental concerns. The aim of this combination is to maintain or enhance production/services (productivity), reduce the level of production risk (security), protect the quality of natural resources and prevent soil erosion and water degradation (protection), be economically viable (viability) and to be socially acceptable (acceptability) (Smyth and Dumansk 1995, 402). These five goals – the pillars of Smyth and Dumanski's framework – must be satisfied simultaneously for a land use to be considered sustainable. Sustainable land management is a shared responsibility between the farmer and the rest of society because policies for land use evolve from the latter. Society has a role to play by crafting policies favourable to land management. Attaining the objectives of sustainable land management requires long-term commitments from land owners, governments and the general public. Thus, the introduction of land taxation/commercialisation of agriculture in Zimbabwe should be viewed in the light of Smyth and Dumanski's FESLM.

This study also makes use of a framework by Serageldin (1994) that raises social, economic and institutional objectives of an environmentally sustainable agrarian undertaking.

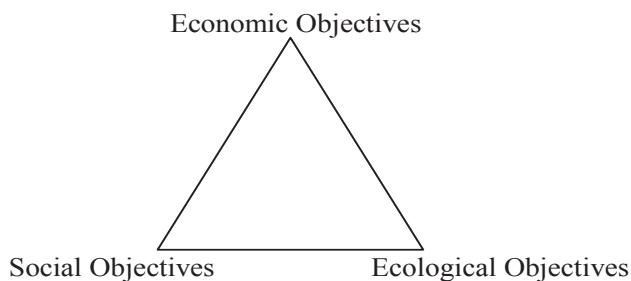


Figure 1. Framework for the Study

SOURCE: Serageldin (1994).

The economic objectives of an environmentally sustainable agrarian undertaking include growth, equity and efficiency while social objectives include empowerment, participation, social mobility, cultural cohesion, cultural diversity and institutional development. The ecological objectives of this model include ecosystem integrity,

carrying capacity, biodiversity and global issues (Serageldin 1994, 2). According to this framework a delicate balance of the three corners is a precondition for the sustainability of development. However, some critics are not quite comfortable with this discourse of sustainable development. Williams (1998), for example, argues that there is confusion over what is to be sustained, whether it is the natural resource or the livelihoods derived from the exploitation of the resources. Radical theorists also argue that sustainable development is difficult to attain in a capitalist world economy. Blame for environmental degradation is said to be laid at the doorsteps of the poor communities/countries while at the same time the culpability of the developed countries in environmental degradation is minimised (Williams 1998, 23–33). Insufficient attention is also paid to the structural relationship between poverty and environmental degradation. Suffice to say, hard as it might be planners should always try to mainstream environmental concerns even as they battle against the goals of food security and development.

2.2. Research Questions

In the context of the above and the Ministry of Lands and Rural Resettlement's introduction of a land tax to unlock agricultural potential among the newly resettled farmers [both A1 and the larger scale A2 farmers], this paper interrogates that institutional arrangement. How do the participants in this agricultural revolution view this proposal? What are the merits and demerits of the proposed tax? What is the capacity of that land tax to produce the intended effect? Is the government supposed to continue with it or not? If the policy is to succeed what other interventions should be put in place?

3. Methodology and Methods

This study makes use of qualitative methods. Anderson and Arsenhault (1998) conceptualise qualitative methods as a form of inquiry that explores phenomena in its natural setting and uses multiple methods to interpret, understand, explain and bring meaning to them. This type of methods is concerned with understanding phenomena rather than measuring them because the latter is ideally done best by quantitative techniques. Creswell (2003) also posits that qualitative methods enable the researcher to use multiple methods that are interactive and humanistic, thereby, giving researcher flexibility when undertaking research in its natural setting. Qualitative methods was found appropriate because of the desire to capture the opinions and experiences of the new farmers with respect to land taxation also in addition to what they thought needed to be done to make the land tax more effective.

Using the descriptive design the study triangulates a number of data collection techniques so as to gain deep insights into the history, dynamics and prospects of Zimbabwe's land reform programme. It largely makes use of purposive sampling targeting some of the major participants in Zimbabwe's agrarian revolution. Mason (1996) says that purposive sampling obtains data from target specific groups of people who possess traits or characteristics present in the population. Purposive sampling is ideally for gathering data to generate theory rather than to test or falsify an existing theory. A non- probability sampling technique was chosen because it bodes well with qualitative methodology. The study purposively targeted representatives of farmers 'organisations, leadership of the Bankers Association of Zimbabwe (BAZ) and captured some of the voices of concerned farmers selected through non- probability sampling techniques. A total of 20 purposively sampled farmers half of them with smaller holdings and the other half with much larger holdings were included in this study. This was done to find out whether size of land holding has a bearing on acceptance or rejection of the land tax.

3.1. Methods of Data Collection

There was a triangulation of methods. One of the major methods used was document analysis. The researcher pursued sources that had something to do with the land reform in Zimbabwe in general and on land taxation in particular. These were mainly secondary sources as well as government sources such as *The Herald*. Data from these sources were augmented, and sometimes cross-checked by interviews with some of the participants in this agricultural revolution. Open ended interviews were carried out with the 20 purposively sampled farmers so as to allow the respondents to air as much of their views as possible on the feasibility and desirability of the proposed land tax. Views of Ministry of Lands and Rural Resettlement officials regarding the land tax were gathered since they were quite central to the land reform programme. In the process, an historical approach was adopted so as to have insights into what happened in the past and how it is impinging on the present. This ensures an appreciation of the present dynamics of the intervention.

3.2. Data Analysis

In data analysis the thematic approach was used. Particular themes emerging from data were put in groups and then synthesised. Data were then presented in an integrated manner in order to avoid presenting data in a piecemeal manner.

4. Debating the Land Tax

4.1. Arguments for the Land tax

There are plans to introduce a land tax of US1 per hectare per month on both A1 and A2 farms in Zimbabwe (*The Herald*, 10 January 2014) with the revenue to be channelled towards infrastructural development. This proposal was being mooted by the Ministry of Lands and Rural Resettlement headed by Dr. Douglas Mombershora. This commercialisation of agriculture might represent a major rethink on development policy in general and land policy in particular. This might signal the end of free gifts of land and inputs in Zimbabwe. This is because since the nationalisation of the land from 2000 onwards agricultural land is no longer bought or sold, it is given for free. Government from time to time has also been assisting farmers with free gifts of fertiliser and seed. The bottom-line is: what are the advantages and disadvantages of such commercialisation of agriculture?

4.1.1. Attacking Multiple Farm Ownership

When this commercialisation was first mooted during the inclusive government, the then Minister of Lands and Rural Resettlement, Dr. Herbert Murerwa stated that the land tax would attack multiple farm ownership (*The Herald*, 16 July, 2009). Those burdened by the weight of the tax would offload the excess land they hold. This view is shared by one Macheke farmer who encapsulated it in the following terms: “Those making noise are the ones who grabbed more than what they can use. Why do you need 700 has when you can afford to work on 20 only” (*The Herald*, 10 January, 2014). The attack on multiple farm ownership is apparent but the reaction of the farmer from Macheke also speaks to downsizing or rightsizing. The Utete Presidential Land Review Committee also noted that the “one man – one farm” policy of government had been flouted by some greed elements on the ground since the start of the fast track land reform exercise (Utete 2003). This means that those greed elements and those with political clout had amassed more than they could efficiently utilise. If farmers hold much more than they can efficiently utilise, they would be forced to relinquish the remainder through economic forces. However, the questions that confront us are: what farm size is appropriate in a particular agro-ecological zone? Are smaller farms more productive than bigger farms? Do smaller farms generate more employment and economic activity than bigger farms? These are issues that require further interrogation within the Zimbabwean context. The revenue collecting register would also take note of those people whose names would appear more than once. Thus, land taxation would attack multiple farm ownership in many ways.

4.1.2. Making Farming a Business

Farming is a business and businesses are supposed to pay corporate tax. Farming is thus no exception and so must pay tax. Treating farming as a serious business would make farmers to seriously consider selling their produce into new value chains so as to raise cash with which to meet their tax obligations and generate more economic activity in the country. Research has shown that with an agricultural-led development strategy that is concentrated on small landowners there is a high degree of stimulus to the remainder of the economy – the “multiplier effect” (Cypher and Dietz 2004). Thus there will be so many positive effects downstream. This augurs well for environmentally sustainable development and food security of the country.

4.1.3. Infrastructural Development

Levels of infrastructure are far below the standard that infrastructural development on the farms in Zimbabwe needs to be seriously re-considered. Fire guards, roads, schools, clinics, irrigation infrastructure and farm houses among others should be available on the farms. The infrastructure combined with the appropriate technologies and technical skills would ensure increased production and productivity on the farms. So instead of being just dead capital as postulated by the dead capital theory (Wilfahrt 2008), the farms would indeed be centres for generating local development and production. This is because land taxation does not take into account improvements on that land. Improvements by land owners in land and buildings and any other infrastructure are not taxed /penalised. Some of the funds from land taxation should be dedicated towards infrastructural development on the farms.

4.1.4. Stimulating Production on Farms

Land taxation encourages productive use of the land. Unutilised pieces of lands will become burdensome on the land owner as they are obliged to pay tax, whether utilised or not. However, land taxation is levied just on the land. What basically changes is the incentive to have land idle which is seriously attached by land taxation (Dye and England 2009). It will no longer be profitable to have a fallow land because such land will still be subject to taxation. Thus production on the farms is stimulated through land taxation since it too expensive to hold onto unproductive land. Post-land reform Zimbabwe is replete with cases of unproductive use of the land. Presiding over a case of contestation over land ownership in Mutare, a matter in which land reform beneficiary Fungai Chaeuka was practising horticulture on a mere one hectare of land out of a possible 498 hectares of Lot 5 Mazonwe farm, Justice Nicholas Mathonsi ruled that beneficiaries underutilising the land would have

their offer letters withdrawn and land given to more deserving farmers. Justice Mathonsi ruled, “The government policy on land reform is not recreational, neither is it designed to accord beneficiaries some pastime. It is meant to benefit those willing and able to utilise land. One cannot be allowed to hold on to large tracts of land they are not using simply to baby-sit an inflated ego” (*The Herald*, 27 February, 2014). The land in this dispute was eventually returned to its former owner, Ms. Heather Guild. This case represents a convergence of legal and financial instruments with regard to their aims of the land reform programme in Zimbabwe. This ruling, together with land taxation can go quite some way towards attaching unproductive use of the land. Thus land value taxation discourages unproductive use of land. Instead, it becomes economical to productively use the land so that it doesn’t become burdensome just to hold on to land as some “status symbol”¹. While on one hand non- production is penalised, production on the other will bestow many advantages on the land owner in particular and economy in general.

Increased production on the farms will bestow several advantages on the economy through increased activity on the value chain. It will, for instance, reflect on prices of commodities down the value chain. Prices of agricultural commodities like mealie –meal will be affordable during scarcity of production. Economic development is also encouraged through availability of more goods on the market. More goods more choices and the better it becomes for consumers in the national economy. Underlining some of the challenges faced by agriculture in developing economies Cypher and Dietz (2004, 342) talked of “overwhelming pressure to transform the sector via market-driven forces towards production of higher value-added “non-traditional” crops destined for export and urban areas”. Further increased production also creates employment opportunities directly and indirectly. Before the introduction of the Fast Track land reform in Zimbabwe, the agricultural sector used to be one of the major employers in the country. Stimulation production might revive the employment creating ability of this industry/sector.

4.1.5. Land Tax is a Source of Government Revenue

Against a backdrop where there is tight liquidity in the general economy the government is unable to pay its employees in time for lack of funds. Eighty per cent of government revenue goes towards recurrent expenditure and that leaves very little for infrastructural development. Multilateral financial institutions like the World Bank and IMF are not willing to extend any new lines of credit to Zimbabwe before the country clears its arrears of about US\$1.2 billion (*Newsday*, 5 March 2015). The country owes a total external debt of about US\$10 billion. The Finance and Economic

Development, Minister Patrick Chinamasa, is even proposing amendment of the constitution in order to reduce the size of the legislature which he says has become too burdensome for the size of Zimbabwe's economy. What makes the situation even worse for the state is that companies are folding up and that reduces its tax base. The Zimbabwe National Statistical Agency said that 30,100 jobs were lost in the mining and manufacturing sectors in 2014 alone (www.newsdezeimbabwe.co.uk 16/04/15). According to the Finance Minister about 4,600 companies closed down between 2011 and 2014 resulting in 64,000 job losses (www.newsdezeimbabwe.co.uk 16/04/2015). Those who lose their jobs and many of the tens of thousands coming out of the school system are finding themselves in informal jobs and that does not augur well for inflows into the fiscus due to the inexistence of a framework for taxing the informal sector in Zimbabwe. The country is in dire financial straits. This makes a land tax quite timely and welcome for a national fiscus that is struggling to balance its books. A land tax is quite advantageous to the Zimbabwean economy because it is quite broad-based. A land tax is not mutually exclusive to other tax programmes but instead **augments other taxes.**

5. Arguments against the Land Tax

As rightly observed way back by Whittaker (1914, xvii) taxation is a burden that is universal and ever present. It is thus almost always resented and is usually avoided whenever and wherever possible. For this reason, it is no major surprise that some compelling arguments are put forward against land taxation. Even experiences from different countries and contexts have not brought about unanimity regarding land, land reform and land taxation.

5.1. Double Taxation

Already farmers are paying levy to the local rural district Councils and a direct land tax will thus represent some kind of double taxation. This is a fact that has been bemoaned by many farmers as echoed by Mr. Johnson Mapira, Vice President of the Zimbabwe Commercial Farmers Union (*The Herald*, 10 January 2014). This becomes burdensome particularly against a backdrop of general undercapitalisation among the generality of the new farmers and the general tight liquidity in the economy. Undercapitalisation is a concern that has been acknowledged even by the President of the country, Robert Mugabe. While giving a keynote address at centenary celebrations of his former school, Kutama College, Robert Mugabe said, "The (A2) farms require huge capital and good management but they don't have it..." (www.newsdezeimbabwe.co.uk/2015/03/22). This undercapitalisation has been further compounded by the failure to

access financial support from banks that do not regard the 99-year leases as bankable instruments (Herald, 20 January 2015).

5.2. Charges too Steep

According to the Vice President of the Zimbabwe Farmers Union, Mr. Berean Mukwende, although the introduction of the land tax was good in terms of development, the charge of US\$1 per hectare per month was very high (*The Herald*, 10 January 2014). The steepness of the land tax was corroborated by the Zimbabwe Indigenous Women Farmers Association Trust leader Mrs. Depina Nkomo who said, “The charges are exorbitant and should be reduced. Areas such as Matabeleland that have poor harvests annually, therefore, will need to pay less since they won’t be able to cater for the costs” (*The Herald*, 10 January 2014). Describing the US\$1 per ha per month as exorbitant might be debatable. Such a description flies right in the face of the very intention of the tax. Those who become unable to pay the tax should offload excess holdings and remain with acreages they can afford to pay for. In any case, it does not require the approval of thieves to come up with criminal codes! What the authorities need to do is going ahead with this tax and reviews it down the road on the basis of periodic monitoring and evaluation of how farmers cope with the tax.

6. How the Land Tax Should be Determined

It is my contention that the land tax should be levied according to the agro- zonation of the country. That is to say the well endowed farms in regions one, two and three should be charged according to their endowments. Region one has high amounts of rainfall of up to 1,200mm/year as well as deep fertile soils. This zone is quite conducive to the production of crops including plantation crops like tea and coffee. A hectare in these regions should be charged as much as four or five hectares in regions four and five that are less endowed with rainfall and good soils. This, coupled with smaller land holdings in the better agriculturally endowed regions, would ensure that more households get land for their livelihoods. The maximum farm sizes should also be set and this should be ecologically determined. In the determination of the land tax to be charged there should be widespread consultation of stakeholders like researchers, the farmers themselves, Farmers organisations, Ministry of Finance officials and the Zimbabwe Revenue Authority. Stakeholder input into the tax to be paid would ensure commonality of purpose and maximum co-operation from all concerned parties.

7. Has Land Taxation Stimulated Food Security via Sustainable Use of Land?

The connection between land tax and food security in Zimbabwe is not a spurious one. This is because in the context of the tax and motivated by the desire to make farming self-sustaining, empirical data shows that farmers have made serious efforts to ensure sustainable use of land to stimulate production and productivity. In this qualitative study, the views and experiences of 20 purposively sampled farmers were gathered with respect to whether or not the introduced land tax had stimulated production and productivity on their farms. In all the 20 cases sampled from the Midlands, Masvingo and Mashonaland Central provinces, the farmers indicated that indeed the land tax had somewhat re-engineered them towards efficient utilisation of the land. Since the introduction of the tax, all the 20 cases recorded a marginal increase in cereal production of at least two tonnes per farm from the early years after land reform but the figures were said to be lower than the 2013/14 agricultural season when rainfall was plentiful. According to them, the major driver towards more sustainable use of the land was the desire to make farming self-sustaining. They said they could not use their other resources to pay off the land tax. All the sampled farmers had at least two permanent farm workers and they also highlighted a desire to make their employees contribute something towards their continued stay on the farms. The farm workers were supposed to be productive and help meet the costs for their continued stay and welfare on the farms. Looked at from this perspective, it can be argued that indeed that land tax stimulated an urge towards sustainable use of the land so as to make farming self-sustaining and to attain local food security. However, this bid has not been without its own challenges. Undercapitalisation is still a major stumbling block and, therefore, the need to unlock financial capital from financial institutions. Insecurity of tenure was noted to be another setback that still needs the attention of the authorities. In the context of incessant rains (most probably due to climate change) the development of irrigation infrastructure on the farms is another aspect that was noted by the farmers to require urgent attention. Thus, interview data from the farmers indicates a direct nexus between land tax and a desire to use land in a sustainable manner which then guarantees food security even though there are challenges.

8. Other Necessary Measures

The land tax cannot work in isolation from other measures. It needs to be complemented by a plethora of other interventions to bring about sustainable use of land and food security in Zimbabwe.

8.1.1. Security of Tenure and Making 99 Year Leases Bankable

The emergent farmers were not given title to the land and arguments were put forward that the ‘new’ farmers were not as productive as they should and did not carry out farm improvements because they lacked title to the land (Masiwa and Chipungu 2004, 217). With respect to tenure, the Presidential Land Review Committee chaired by Dr. Charles Utete also had also made the following observation. “Finally, in the course of its work the Committee drew Government’s attention to a number of problem areas that the committee felt required early resolution, including: the issue of legal title for beneficiaries of the A2 model, among other things, the fact that on the one hand, such title is vital for assured productive use of the land and,…” (*The Herald*, 3 November, 2003). Titles to the land were expected to provide incentives for the newly-resettled farmers to undertake long-term investments on their land (Masiwa and Chipungu 2004). The security of tenure was meant to unlock the farming potential of the emergent farmers necessary to attain food security through increased production and productivity. Thus, from 2007 onwards the state, in response to the calls for title to the land, awarded the new farmers with the 99-year leases. But even the leases were unable to unlocking the necessary financial support from financial institutions that so much more effort needs to be exerted with respect to security of tenure.

The need to make the 99-year leases, a bankable instrument still needs attention. The bankability of the 99-year leases is an issue with which government has been grappling since the inception of the leasehold system. This comes against a backdrop where the agricultural sector is a significant contributor to the gross domestic product (GDP) contributing about 16 per cent of GDP. Despite its importance, this is a sector that requires about US\$2 billion annually according to Minister of Agriculture, Mechanisation and Irrigation Development Joseph Made (*The Herald*, 23 October, 2014). That the government cannot raise this kind of money on its own is quite clear especially against a backdrop of serious de-industrialisation and, therefore, a probable shrinking of the tax/financial base. Thus, not only the support of private financial institutions but also the bankability of the 99-year leases becomes imperative.

From the inception of the leasehold system, the 99 -year leases are made bankable. This can be gathered from section 25.2.1 of the Lease Agreement that reads, “Subject to this Clause, the Lessee may use this Lease as collateral in securing financial assistance from any Lender”. This was done against a backdrop of a realisation that most of the newly resettled farmers would require financial assistance at one point or the other due to general undercapitalisation in the

country. Despite that pledge, the financial institutions have not been so promising in accepting the 99-year leases as collateral value.

As way back as 2009, the government realising that banks were adamant in accepting the leases as collateral, set up a team within the Ministry of Lands and Resettlement to revisit the 99-year leases. The basic idea was to enable farmers to use them as collateral for loans from financial institutions. The then Lands and Resettlement Minister, Hon Herbert Murerwa, bemoaned the fact that the 99-year leases lacked collateral value. In his own words, the minister had remarked, "They give A2 farmers security of tenure, but do not have collateral value" (*The Herald*, 16 July, 2009). He continued, "It is necessary that these can be used as collateral. Farmers can go to banks and borrow using the leases as collateral". To this end, the minister reiterated that the ministry was working round the clock to mobilise resources so that they could kick-start the surveying and registration of farms, a necessary prelude to securitising leases with banks. However, it seems several years down the line banks are still dissatisfied with the 99-year leases as some form of collateral.

Whether and how the 99-year leases are scrutinised is still quite ambiguous. What is however, quite clear is that banks in Zimbabwe apart from Agribank have been adamant to give loan to holders of 99-year leases. Banks have been on record arguing that the 99-year leases are not bankable instruments. Even the former Minister of Finance in the Inclusive Government which lasted from 2009 to July 2013, Mr. Tendai Biti, used to argue that the leases were not bankable instruments. Thus, scuttled farmers' ability to acquire loans from financial institutions for the agricultural operations is not viable. Without access to loans and without strong financial resources of their own it becomes difficult to figure out how these new farmers would become quite productive. Given a background of general undercapitalisation among the new farmers, it becomes difficult for these farmers to achieve sustainable agriculture that stimulates economic activity in Zimbabwe.

Newsdzezimbabwe.com of 20 January 2015 reported that Zimbabwe's 99-year leases are not bankable. (Newsdzezimbabwe.com 20/01/15). What this means is that the holders of the 99-year leases cannot use these instruments as collateral security to access financial capital from banks. Financial support from financial institutions is imperative if production and productivity are to be improved in Zimbabwe where the state is unable to support the farmers without assistance from other stakeholders. To reinforce this point, there is evidence that government has been engaging banks with a view to making the leases more bankable than they are purportedly at the moment.

In a newspaper article titled “99 Year Leases Work in Progress” *The Herald* reporter noted that the Bankers Association of Zimbabwe (BAZ) was still dissatisfied with a number of issues and this compromised the bankability of the 99- year leases (*The Herald*, 20/01/15). The rejoinder from the BAZ came after the Minister of Lands and rural Resettlement Dr. Douglas Mombeshora had intimated that government had addressed the sticking points banks had raised with the leases. The farmers who in most cases are in dire financial needs had found the minister’s pronouncement quite welcome since that would have paved the way for making their leases collateral when securing funding from banks. Unfortunately, the financial institutions found that pronouncement to be quite premature. Similarly, BAZ Executive Director, Mr. Sij Biyam observes,” While a lot of work had gone into making the leases “collateral friendly, there was still areas to be resolved between government and the Bankers association of Zimbabwe to make them bankable.” (*The Herald*, 23 October, 214). “It is pertinent to highlight the sticking points from the point of view of the financial institutions. Bank officials maintain that property laws in Zimbabwe treated land and improvements on the land as inseparable and transferable in that combined form. The challenge that would emanate from advancing loans to new farmers is that the asset (land) belongs to Government and banks cannot mortgage the land. “As such the loan cannot be secured against the land”. (*The Herald*, 23 October, 2014). “The security is only created after the funds have been released to farmers. The lease can only become collateral when there has been improvement on the land, as land belongs to government”. The argument of the banks is that they cannot secure an asset that does not exist at the time of advancing the loan. That is financially risky.

The other concern of financial institutions relates to the consequences of the lease agreement termination. “If government terminates the lease, what happens to the improvements on the land (under the 99- year leases), so there are a lot of grey areas” (*The Herald*, 23 October, 2014). Financial institutions fear to lose the funds for the improvements that would have been done using finance from them. There is no clarity in terms of legislation regarding that legitimate worry (Interview, 30 March, 2015). All these issues combined have undermined the confidence of the institutions in giving loans to farmers on the basis of the 99-year leases.

8.1. Irrigation Agriculture

Though briefly alluded to under infrastructural development, the issue of irrigation agriculture needs slightly more attention given its centrality to food security in rainfall-erratic regions such as the one in which Zimbabwe is located. If sustainable agriculture and food

security are to be achieved, the country needs to pursue the development of irrigation with more vigour than ever. Dams that are heavily silted need to be scooped while new ones also need to be constructed. This is because the country is at the mercy of vagaries of climatic variability. For instance, the 2014/15 agricultural season witnessed early cessation of rainfall and as such the country has a grain deficit of 1,400 000 tonnes. This shortfall has to be covered by imports if food security is to be realised. Had the country harnessed irrigation agriculture such shortages might have been averted (Interview, 4 April 2015) In this regard, proceeds from the land tax need to be considerably channelled towards development of irrigation agriculture. It is never too late for the various stakeholders of national development and food security to jump-start a process of investment in irrigation to curb the problem of dependence on seasonal or unreliable rain and achieve environmentally sustainable agriculture and food security.

9. Summary of Findings

Previous studies on the land reform programme in Zimbabwe can be categorised into clusters comprising those that looked at the historical basis of the reform programme. (e.g. Moyana 2012; Bowyer-Bower and Stoneman 2000). There is also a group of scholars who concentrated on the unfolding of that land reform process and its possible impacts on production and productivity (e.g. Sadomba 2008 and Nyawo 2012). More recent scholarly attention has been geared towards the outcomes of the land reform programme. Under this group, the work of Scoones *et al.* (2010) stands out as one that has tended to give thumbs-up to the emerging agrarian revolution in Zimbabwe. In this last cluster Moyo and Chambati (2013) edited a book with so many scholarly papers that grapple with the post land reform dispensation. Moyo and Chambati (2013, 70) also indicate that there are second generation questions about Zimbabwe's land reform programme such as issues revolving around multiple land ownership and oversized landholdings. The current paper should be viewed in the same light as works that have sought to interrogate what had happened to Zimbabwe's agricultural landscape in the post- land reform era. It specifically sought to debate the institutional arrangement that has been put in place in order to correct some shortcomings arising out of the land reform programme. The Government through the Ministry of Lands and Rural Resettlement has just introduced a land tax which is meant to enforce multiple farm ownership in the post-land reform phase and boost production through investments on farms in Zimbabwe. However, the land tax was introduced recently. The issue might still be elastic enough for empirical evaluation in terms of ability to stimulate production and investment on the farms and whether or not, this

policy intervention is still worth interrogating. The Ministry of Lands and Rural Resettlement responsible for the introduction of the tax is still in the process of fine tuning the institutional arrangements necessary for the operationalisation of this tax but what this paper sought to do was to debate on the introduction of the policy. It gathered the views of farmers and farmers' representatives on the proposed land tax. Views of the BAZ were also gathered with respect to their position on the bankability of the 99- year leases in Zimbabwe. This was because they work hand-in-hand with farmers. Their views on the merits and limitations of the land tax were gathered to improve the effectiveness of this institutional arrangement accordingly.

Two major polarities regarding the proposed institutional arrangement have emerged from the study. On the one hand, there is a group of farmers who are against the proposed land tax. It is possible to insinuate that some of the farmers in this group are people who had flouted the one man- one farm principle and thus are trying to defend their ill- gotten property. Some might be described as the lazy ones and would embrace a *laisse -faire* situation on the farms with very little production and monitoring. On the other extreme, there are farmers who are keen to support government in its bid to raise production and investments on the farms. Some of them in this group, however, bemoan the high rate of the land tax. However, for the success of this intervention, there is need to put in place a number of other institutional arrangements to buttress the introduction of the land tax. Production may be stimulated provided that the issues of security of tenure on the farms are addressed because without security of tenure it becomes difficult to see how long -term investments may be made on the farms. Requiring contemporaneous attention is the bankability of the 99- year leases held by larger -scale A2 farmers and A1 permits that are *a sine qua non* for the unlocking of capital which most new farmers lack. Without financial support from financial institutions stimulating agricultural production and productivity on the farms will remain a huge challenge given the undercapitalisation faced by the generality of Zimbabwean small-scale and larger-scale farmers.

The introduction of the tax will also have other positive by -products. Not only will it give the state the financial capacity to carry out investments on the farms such as developing irrigation agriculture, roads, clinics, schools and other infrastructure but also a financial boon to a cash strapped government. The revenue realised through the land tax could provide a huge relief to a government in dire financial straits. Apart from investments on the farms, the revenue from the tax could be used to repay the state's agricultural loans as well as to subsidise agricultural inputs so as to stimulate sustainable and optimal utilisation of the country's land resource.

10. Conclusion

The paper interrogated the merits and demerits of the proposed land tax in post land reform Zimbabwe. It argues that while the land tax is rather steep, especially, against a backdrop of general tight liquidity in the country, it can go a long way towards achieving a number of things. It can raise the much needed revenue for the cash strapped government that is even finding hard to assist its cash strapped farmers and to pay civil and quasi-civil servants. The land tax can attack multiple farm ownership which has for long dogged the fast track land reform programme. Land taxation can also go a long way towards encouraging production on the farms thereby stimulating more economic activity down the value chain. Production will be stimulated out of a need to raise cash with which to meet the tax obligation. However, for the land tax to succeed, complementing it with a number of interventions like re-investing some of the raised money from taxation on infrastructure development on the farms is mandatory. Encourage irrigation farming in order to make agriculture less susceptible to the vagaries of the weather is also needed. More significantly, issues of security of tenure need to be resolved so that farmers can engage in long- term investments without the fear of losing their investments. If issues of security of land tenure and investment on the farms are not addressed they will continue to be an albatross on the neck of government's efforts to improve food security in Zimbabwe. Thus, the paper argues that for the land tax to succeed it has to be complemented by a conjuncture of other factors.

Note

- ¹ President Robert Mugabe recently lashed out at A2 farmers in Zimbabwe who are holding onto large tracts of commercial farmland without being quite productive. He said this on the occasion of his 91st birthday as well as on a recent state visit (end of March 2015) to Algeria (The Herald, 30 March 2015). He hinted that government would soon embark on an audit to ensure that land is fully utilised.

References

- Anderson, G. and Arsenhault, N. 1998. *Fundamentals of educational research*. London: Routledge.
- Bowyer-Bower, T.A.S, and Stoneman, C. 2000. *Land reform in Zimbabwe: Constraints and prospects*. Aldershot UK: Ashgate Publishers.
- Chitsike, F. 2013. A critical analysis of the land reform programme in Zimbabwe. Paper presented at the 2nd F I G Regional Conference, Marrakech, Morocco, December 2–5, 2013.

- Cypher, J. M and Dietz, J. L. 2004. *The process of economic development*. 3rd edition. London and New York: Routledge.
- Creswell, J. 2003. *Research design: Quantitative, qualitative and mixed method approaches*. California: Sage Publications.
- Dye, R. and England, R. 2009. *Land value taxation: Theory, evidence and practice*. Cambridge: Lincon Institute of Land Policy.
- FAO .1992. *Agriculture, food and nutrition for Africa: A resource book for teachers*. Rome: FAO.
- George, H. 1879. *Progress and poverty: An inquiry into the causes of industrial depressions and of want with increase of wealth: The remedy*. New York: Appleton and Company.
- Government of Zimbabwe (GoZ). 2002. *Position paper*. Harare: Government Printers.
- Mabhena, C. 2010. Visible vanishing livelihoods’: The case of the Fast Track Land Reform and Resettlement Programme in southern Matabeleland, Zimbabwe. Ph.D.diss. submitted to the Department of Development Studies, University of Fort Hare.
- Madhuku, L. 2004. Law, politics and the land reform process in Zimbabwe. *In: Post-independence land reform in Zimbabwe: Controversies and impact on the economy*, edited by M. Masiwa. Harare: Institute of Development Studies.
- Mamdani, M. 2008. Lessons of Zimbabwe. *In: London Review of Books*, (30)23: 17–21..
- Mandaza, I. 1987. Introduction. *In: Mandaza, I. (Ed.), Zimbabwe: A political economy of transition, 1980 – 1986*. . Dakar: CODESRIA.
- Masiwa, M. and Chipungu, L. 2004. Land reform programme in Zimbabwe: Disparity between policy design and implementation. *In Masiwa, M. (Ed.), Post-independence land reform in Zimbabwe: Controversies and impact*. Harare: Fredrick Ebert Stiftung.
- Mason, J. 1996. *Qualitative research*. London: Sage Publications.
- Moyana, H. V. 2002. *The political economy of land in Zimbabwe*. Gweru: Mambo Press.
- Moyo, S and Chambati, W. (Eds.). 2013. *Land and agrarian reform in Zimbabwe: Beyond white-settler capitalism*. Dakar: CODESRIA.
- Moyo, S and Matondi, P. B. 2008. Interrogating sustainable development and resource control in Zimbabwe. *In: Amannor, K.S. and S. Moyo (Eds.), Land and sustainable development in Africa*. London and New York: Zed Books.
- Ngwenya, J. 2014. An assessment of the impact of fast track land and agrarian reforms on food security in Zimbabwe: The case of Umguza District. M.A. thesis , Midlands State University.

- Nyawo, V. Z. 2012. *Mayibuye: Dilemmas of agrarian reform in independent Zimbabwe and South Africa*. Gweru: Mambo Press.
- Ranger, T. 2009. Re: Lessons of Zimbabwe. *ACAS Bulletin*, Vol. 82, No. 1.
- Sachikonye, L. 2004. The promised land: From expropriation to reconciliation and *jambanja*. *In*: Raftopoulos, B. and T. Savage (Eds.), *Zimbabwe: Injustice and political reconciliation*. Cape Town: Institute for Justice and Reconciliation.
- Sadomba, W. 2008. War veterans in Zimbabwe: Complexities of a liberation movement. *In*: An African post-colonial settler society. PhD diss., Wageningen University, The Netherlands.
- Serageldin, I. 1994. Making development sustainable. *In*: Serageldin, I. and A. Steer (Eds.), *Making development sustainable: From concepts to action: Environmentally Sustainable Development Occasional Paper Series*, No.2, World Bank, Washington, DC, pp. 30-33.
- Scoones, I., Marongwe, N., Mavedzenge, B., Murimbabrimba, F., Mahenehene, J. and Sukume, C. 2010. *Zimbabwe's land reform: Myths and realities*. Harare: Weaver Press.
- Smyth, A. J. and Dumanski, G. 1995. A framework for evaluating sustainable land management. *In*: *Canadian Journal of Soil Science*, 75: 401 – 406.
- United Nations World Commission on Environment and Development (UN WCED). 1987. *Report of the Commission on Environment and Development: Our common future*. New York: UN WCED.
- Utete, C. 2003. *Report on the presidential land review committee on the implementation of the fast track land reform programme, 2000– 2001*, volume 1. Harare: Government of Zimbabwe.
- Wilfahrt, M. 2008. Why 'freeing dead capital' won't help west African pastoral populations: Citizenship, hybridity, and local law in land 'law' reform. Paper presented at the spring 2008 Institutional Analysis and Development Mini- conference, Indiana University-Bloomington, 26–28 April.
- Williams, M. 1998. Aid, sustainable development and the environmental crisis. *In*: *International Journal of Peace Studies*, 3(2):19–33.
- Whittaker, Sir T. 1914. *The ownership, tenure and taxation of land*. London: Macmillan and Co Ltd.
- www.newsдзеzimbabwe.co.uk/2015/03/22.
- www.newsдзеzimbabwe.co.uk/2015/04/16.
- www.mikecampbellfoundation.com/page/campbell-case-decisions-by-sadc-tribunal.10/04/15.

CHAPTER NINE

A Holistic Strategy for Improving Gender-Power Relations and Food Security in Tigania, Meru County, Kenya

Constance R. Ambassa

Abstract

Agricultural growth remains slow in many countries in Sub-Saharan Africa due to many challenges leading to food-insecurity, malnutrition and high levels of poverty. Stakeholders have initiated interventions in the sector in order to reduce poverty and increase food security. The Global Fund for Women (GFW) supported rural women's groups working on sustainable agriculture in Burkina Faso, Kenya and Uganda. Grantees were expected to train rural women on agro-ecological techniques for increased food security, access to resources and empowerment on women's rights. This integrated approach to improved livelihoods is guided by the conviction of GFW that grassroots organisations must address barriers to women's access to assets, participation and train them in sustainable agriculture and food production in order to reduce poverty and improve food security and nutrition of households. This approach recognises gender-power relations in Africa that sometimes hinder women from accessing land and owning property to improve the food security of their households. This paper presents a holistic strategy that was used by the GFW to address gender-based barriers to access land, other resources and build capacity of women in agro-ecological technologies to enhance food security and nutrition in Tigania, Meru County. The survey was conducted among 40 beneficiaries of the programme. Four focus group discussions, eight in-depth interviews and one informal discussion were equally conducted. The sample size was 104. Quantitative and qualitative data were analysed using Excel 2011 and Nvivo 10 softwares, respectively. Results demonstrate that an integrated approach yields better outcome measures by enabling both men and women to acquire new knowledge for improved food security, improves harvests and increases diversity in crops grown and consumed, adds value to agricultural products, raises awareness of women on their human rights and enables them to own property and improve their livelihoods. Therefore, support for grassroots' institutions yields better results.

Keywords: food security and nutrition, poverty reduction, women's empowerment, integrated approach, sustainable agriculture.

1. Introduction

1.1. Background

The primary element of development, including food security, is enhancement of freedom and dependency on the free agency of people (Sen 1999). Sen's vision focuses on a 'capability approach', where the basic concern of human development is 'our capability to lead the kind of lives we have reason to value', rather than the usual concentration on rising GDP, technical progress, or industrialisation (Sen 1999, 285). O'Hearn (n.d) criticises Sen's 'entitlement' and 'capability' approaches as individualistic in methodology, derived from microeconomics and generalised by adding problems of access to non-market-related entitlements. Another critique argues that Sen's conception of development is 'profoundly neutral' with respect to underlying social relations and the historical specificity of unequal entitlements (Fine 2004). Yet due to liberalisation, communities are broken down *and they lose capacity and capability*. Even those few of their members who manage to gain more education and skills or accumulate some capital through micro-financing find themselves constrained by the way that the market limits where they can sell their labour, to whom, for what price, and in how it is used (Vander Stichele 2008). While we acknowledge the contributions of these scholars, the gender-power relations are undermined and equally influence access to and availability of food. This paper is intended to fill this knowledge gap. Agriculture is perceived as the core of sustainable development because it produces food as well as economic wealth for many of the world's poorest people that allow improved livelihoods (United Nations 2013, 1). The sector has made tremendous success in increasing food production over the past five decades and making food more affordable to many people, despite unprecedented population growth. The transformation of agriculture through research on technological innovations and development capacity has led to high productivity growth in some counties like Brazil and Chile. By contrast, agricultural growth has slowed elsewhere and remains slow in many food-insecure countries in Sub-Saharan Africa (Fugllie, Wang and Ball 2012,5; Sen 1999). Crop yields in Sub-Saharan Africa continue to decline due to raising temperatures resulting from climate change since most farmers rely on rain-fed agriculture. Africa requires immediate investment in adaptation and mitigation actions that address climate change impacts ["climate smart" agriculture] on all dimensions of food and nutrition security (World Bank 2013).

The challenge of food insecurity in Sub-Saharan Africa is compounded by gender constraints that deny some women access to resources such as land and credit facility to improve food production of their households. The worrying trend of food insecurity in Sub-

Saharan Africa has led to concerted efforts by both international and local institutions to address the problem. The Global Fund for Women (GFW) supported rural women's groups working on sustainable agriculture, and the promotion of human rights in Burkina Faso, Kenya and Uganda to train rural women on agro-ecological techniques for increased food security, access to resources and empowerment on women's rights. The research will add to the general understanding of food security by emphasising an integrated approach to improved livelihoods, food security in the context of climate change and empowerment of women to access resources and exercise their human rights. This unique integrated approach is guided by the conviction of GFW that grassroots organisations must address barriers to women's access to assets, participation, and train them in sustainable agriculture and food production in order to reduce poverty and improve food security and nutrition of households. In Kenya, several organisations were funded since 2011 by donors such as the Community Initiatives for Rural Development (CIFORD) Kenya that operates in Tigania, within Meru County. Men in the area grow cash crops such as that (*miraa*) and tea, with good financial returns, while women cultivate food crops on limited land with limited resources and agricultural knowledge. This paper presents findings of a process evaluation that assessed efficiency and efficacy of the projects.

1.2. Statement of the Problem

There have been concerted efforts at the global level to achieve Millennium Development Goals (MDGs) agenda, such as reduction of extreme hunger and poverty by 2015 (Migotto *et. al.* 2005). This pressure has led international and regional organisations, as well as nation states to work together to achieve the set goals. However, despite these efforts, food insecurity remains a great challenge for development in the 21st century. Incidences of food insecurity and poverty are particularly devastating in developing countries, and a lot of resources are being channelled towards programmes aimed at eradicating these challenges by various international organisations and governments of developing nations (Millennium Development Report 2006). Food insecurity and undernourishment is the most acute challenge in Sub-Saharan Africa. These challenges have been compounded by effects of climate change that result either in heavy flooding or drought that destroy farm produce and causes crop failure, respectively. Yet most farmers depend on natural resources and have limited capacity to cope with climate variability and extremes. Women, who carry 80 per cent of the food production burden in Sub-Saharan Africa, are sometimes faced with patriarchal challenges that deny them access to resources and lack of innovative technologies to enhance farm produce (Ambasa 2013).

The Kenyan Government favours horticultural farming as reflected in increased funding for the sector as opposed to food production and research. Importation of cheap food, such as maize is rampant. Consequently, farmers are unable to sell their farm produce in order to afford farm inputs for subsequent farming seasons. In addition, farmers hardly access findings from research institutions on new agricultural innovations due to inadequate coordination and dissemination of results. Yet such knowledge could improve farm produce and prevent wastage during processing and storage. Male farmers, who attend agricultural workshops and shows, sometimes access such information and credit facilities compared with their female counterparts. It is against this background that the GFW joined the international community to improve food security in Sub-Saharan Africa in collaboration with rural organisations in Kenya, Uganda and Burkina Faso. Despite implementation of the project for four years since 2011, little was known regarding implementation process and outcome measures. An attempt was made to narrow this gap in knowledge through an assessment of the implementation process and effects of GFW's project among beneficiaries in Tigania, Meru County.

Four evaluation questions were addressed in the study:

1. How does CIFORD integrate sustainable agriculture and food production with activities to address and promote women's rights in the study area?
2. What key indicators are used by CIFORD to monitor progress in supporting women to become food secure and more empowered at household and community levels?
3. What two agricultural innovations are most effective in scaling-up the project?
4. What experiences and learning processes for overcoming organisational and structural challenges can be adopted from the project? The premise of the evaluation was that provision of flexible, core support grants to rural women's associations can strengthen the organisations' ability to provide information, resources and technologies to their direct beneficiaries that would ultimately improve food security, increase incomes, and advance women's human rights.

1.3. Research Methods

This chapter involves many disciplines like gender studies, agriculture, sustainable development studies, empirical and secondary data. A case study was conducted from November 2014 to January 2015 among stakeholders of CIFORD in Kenya in Tigania, Meru County. The goal of the study was to provide an in-depth

information regarding implementation process and outcome measures of the sustainable agriculture project in preparation for a comprehensive mid-term evaluation that will be conducted at the end of 2015. The case study was conducted using both quantitative and qualitative methods. The researcher randomly selected 40 households from the database of CIFORD to participate in the survey. The study universe comprising 635 households is available and any sample drawn from it will validate the findings of this study.

The researcher gathered data with the help of one research assistant who was trained on objectives of the study and ethics of research using the Revised Ethics Curriculum of FHI360 for three days. Pilot study was conducted to enhance coherence and consistence of research tools and comprehension of questions. The research team visited households of 40 beneficiaries who were randomly selected from a list of 635 beneficiaries of CIFORD. Written informed consent was obtained from all participants prior to their participation in the research. Survey data were collected in the national language, Kiswahili, and each session lasted for about one hour.

Qualitative data were collected through focus group discussions (FGDs), observation method, photography and use of in-depth interviews (IDIs) with key respondents. Participants in qualitative methods were different from those who participated in the household survey in order to validate data from varied sources. Four FGDs were conducted with the following categories of participants: 23 elderly beneficiaries, 23 young beneficiaries, staff of CIFORD and 7 husbands of beneficiaries. Each participant was consented followed by FGDs that lasted for about 2 hours. The researcher moderated all sessions as the research assistant audio-taped and wrote field notes. IDIs were conducted with 8 key respondents to clarify grey areas from FGDs. Some of the interviewees included an agricultural officer, a church minister, the assistant chief, a member of a community group that employs drama to create awareness in the community and a health officer, among others. An unstructured interview was held with 3 interns at CIFORD to discuss their involvement in the programme. The sample size was 104 participants.

Quantitative data were reviewed by the researcher, edited and entered into a database using Excel Software. Qualitative data were transcribed within 24 hours using Word 2010, before the research team could forget proceedings of sessions. The data were codified in Nvivo 10 software on the basis of a Code book that was developed in accordance with FGD and IDI guides. Any emergent codes were added to the code tree as dictated by data. Analysis was conducted by reviewing similar and divergent views. Underlying reasons for

different positions were obtained from coded data. Secondary data were reviewed.

1.4. Organisation of the paper

The paper is organised into four main parts. Part one introduces the topic of food security, climate change and status of women farmers as represented by those in Tigania, Meru County of Kenya. The section also establishes statement of the problem, research questions and methods that were used to collect data. Part two focuses on the theory, conceptual framework and literature review on food security and general status of women that was conducted at global regional and local levels. Part three presents results of the study while the fourth part concludes and presents some recommendations.

2. Theoretical Framework and Literature Review

2.1. Theoretical and Conceptual Framework

This study was set against the theory of **Lenses of Gender** (Bem 1993). The theory recognises three lenses embedded in culture: Androcentrism, Gender Polarisation and Biological Essentialism that provide the foundation to explain how biology, culture and individual psyche interact systematically to install a patriarchal ideology. The **Androcentric** lens puts men at the centre of everything: their experiences are perceived to be superior and normative while women's experiences are perceived as neutral or of little value. The **Polarisation lens** perceives men and women to be different. The male-female difference is superimposed on all aspects of life: social roles, ways of expressing emotion and sexuality. The **Biological essentialism lens** rationalises and legitimises other lenses by treating them as the natural and inevitable consequences of natures of men and women. The myth of Creation is used to legitimise the differences among men and women. The three lenses of gender reproduce a male power structure in two ways: First, men are given more power to access resources and Second, individuals internalise cultural expectations through socialisation process and unconsciously construct identities that are consistent with them (Ambasa 2009, 38). For instance, in the Ameru culture, men are viewed as superior and are not expected to perform productive roles. Their only role is oversight and protection to their households while women are expected to provide farm labour and perform all productive and reproductive roles. The theory of Lenses of Gender was integrated with a Gender Analysis Conceptual Framework that attempts to uncover the dynamics of gender differences across a variety of issues such as **social relations** [roles, duties and responsibilities of men and women]; **activities** [gender divisions of labour in productive, community managing and community politics roles]; **access and**

control over resources, services, institutions of decision making and networks of power and authority and **needs** [both practical and strategic that would change their position in the society] (DFID Framework [n.d.].

2.2. Literature Review: Food Security and Power Relationships

2.2.1 Global Perspective on Food Security

There has been progress in reducing global hunger (protein-energy malnutrition) from about 1 billion people in 1990–1992 (18.6 per cent) of total population) to about 870 million in 2010–2012 (12.5 per cent) (FAO 2012). Regional variation occurs in reduction of food insecurity and malnutrition with Sub-Saharan Africa being the most affected with the problem at the global level. Rising food prices have made it difficult for some households to afford food in Africa leading to more than 8,000 deaths of children on a daily basis from under nutrition, despite unprecedented global growth in wealth and technology (Rosen *et al.* 2012). About 70 per cent of the world's poorest people live in rural areas in Southern Asia and Sub-Saharan Africa. The challenge of poverty and food insecurity among the world's poor could be addressed through improvement of agricultural performance, improvement in market access, reduction in risks that face farmers and investment in rural infrastructure and enterprise (United Nations 2013).

Many countries in the developing world are struggling with water scarcity and building resilience for adaptation to climate change in the agriculture sector (OECD/FAO 2012) The demand for food is a major driver of deforestation worldwide [27 per cent of the world's tropical forests, 45 per cent of temperate forests, 50 per cent of the Savannas and 70 per cent of natural grasslands] (FAO 2011). Consequently, agriculture contributes the largest share of green house gas emissions (Kisinger, Herold and Desy 2012). In Africa, women account for more than half of the agricultural output, 60 per cent of marketing and almost all food production (Mehra and Rojas 2008). Despite their central role in agriculture and food security, women in most African countries often face constraints which limit their capacity to improve food production and enhance food and nutrition outcomes. These include gender inequalities in accessing resources such as land, credit, rural organisations, agricultural inputs, technology, education, extension services as well as “gender blindness” of agricultural development policies and research (Mehra and Rojas 2008). By implication, necessary conditions should be created to increase food production with environmental sustainability by improving women's participation in food production, processing, marketing and preparation. To this end, focus should be directed at the inter-linkages between food insecurity in Sub-Saharan Africa, malnutrition, climate change, green house gas emissions and gender

challenges [or feminisation of agriculture] with a view to reducing poverty and hunger as demanded by Millennium Development Goal number 1 (Millennium Development Report 2006).

2.2.2 Regional Perspective on Food Security

African leaders converged at Sirte, Libya, in September 1999 to deliberate on the how Africa should respond to the current food and nutrition insecurity on the continent. African leaders decided that the continent needed to adopt a holistic, integrated and coordinated agenda for regeneration of the African continent on all fronts; including food security and nutrition issues (Heidhues *et al.* 2004). A New Partnership for African Development (NEPAD) strategic framework was developed to guide the continent in overcoming its myriad challenges. The document was formally adopted by African leaders at the Organisation of African Unity Summit held at Lusaka, Zambia in July 2001. NEPAD accepts liberalisation and globalisation if the process is fair and the play ground for international trade is level. By endorsing NEPAD's policy framework, African leaders jointly accepted responsibility for poverty reduction and food insecurity and placing their counties on the path for sustainable development and growth (Agwu *et al.* 2011).

NEPAD's vision for agriculture seeks to maximise the contribution of Africa's largest economic sector to achieving a self-reliant and productive Africa that can participate fully in the world economy (Huidhues *et al.* 2004). The NEPAD strategy focuses on elimination of hunger and reduction of food insecurity and poverty as well as expansion of exports with a view to placing the continent on a path of sustainable development and preservation of the natural resource base. NEPAD's strategy recognises the pivotal role of female small scale farmers that produce food grains for their households. The strategy attempts to support women to promote measures against resource degradation and encourage agricultural innovations that are sustainable (Huidhues *et al.* 2004).

2.2.3. National and Meru County Perspectives on Food Security

In the recent past, the GoK has allocated limited funds to support the subsistence or food crop agricultural sector. More emphasis has been laid on horticultural and export sectors: a situation that threatens food security in the nation. In Meru County, men cultivate cash crops such as tea and khat (*miraa*) with high economic benefits while women produce food crops to sustain members of their households. Due to high poverty levels, drought and lack of irrigation water in most parts of Meru County (Tigania), farmers cannot afford expensive agricultural inputs such as fertilisers, pesticides and improved seeds intended to increase agricultural production and reduce poverty in rural areas. These limitations, coupled with leached minerals in soils,

translate to poor yields of food crops, thereby perpetuating the cycle of food insecurity and poverty in the drier parts of Meru County such as Tigania where CIFORD concentrates its activities.

The Government of Kenya promulgated the new Constitution in the year 2010. The Constitution recognises the role of women as key players in the political and socio-economic development of their country. Thus, it provides opportunities for women to exercise equal rights with men over ownership of property such as land, decision-making, appropriation and sale of immovable property. The Constitution has provision for creation of an independent Land Commission to address historical land injustices that have affected the majority of people living in marginal unproductive areas, hence disenfranchised. Despite positive aspects in the Constitution, older women in Meru County, unlike girls of today, dropped out of primary schools after undergoing female genital mutilation (FGM). They, therefore, lack the capacity, skills and awareness which would have enabled them to participate in political matters that affect their lives for the better.

The Ameru culture puts more premium on the boy than girl child. Women and girls are marginalised and hence more vulnerable to poverty and food insecurity. The situation is worsened by high illiteracy rates among females, exposure to retrogressive cultural practice of FGM and gender-based violence that is mostly fuelled by food insecurity. Women bear the brunt of performing most household chores and men merely serve supervisory roles or herd cattle. Women make decisions regarding cultivation and mostly perform agricultural activities alone. They weed and harvest food crops but decisions over utilisation of agricultural products are made by male owners of land. Sometimes, men sell farm produce, allocate more land to cash crops than food crops and lease out land without involving women in the decision making process (Ambasa 2015). Women are too busy to attend communal meetings where information on agricultural extension work such as new agricultural technologies that could improve their food security is disseminated

2.2.4. Inter-Linkages between Gender, Food Security, Climate Change and Agriculture

Women play a vital role in the three components of food security: food production, food distribution and food use and processing (World Bank 2009). Women also undertake a range of community led- activities that support agricultural development such as soil and water conservation, afforestation and crop domestication (Habtezion, Scott and Babugura 2012). Despite these roles, women often shoulder a greater burden in responding and adapting to climatic stresses due to their lack of access to land, financial services, social capital and technology. In some areas, discriminatory social attitudes

and traditions are sanctioned by law. Empowering women and girls is not just necessary for their well being but also a means of broader agricultural development and food security (World Bank 2009). Studies show that if women are given access to resources (such as land, finance and technology), as men, their agricultural yield could increase by 20 to 30 per cent; national agricultural output could rise by 2.5 to 4 per cent and the number of malnourished people could be reduced by 12 to 17 per cent (FAO 2011).

In the event of climate change related challenges such as flooding and drought, women are hit hardest because of their role of providing food to members of their households. Women tend to heavily rely on agriculture, a highly climate sensitive sector; hence, stresses of climate change have disparate impacts on their livelihoods (Habtezion, Scott and Babugura 2012). In order to mitigate these challenges, need arises to eliminate gender-based discrimination under the law, ensure gender-sensitive policies and programming decisions and give women greater voice in decision making at all levels in order to mainstream gender in agriculture and food security. These are aspects the GFW strives to achieve by building the capacity of rural women in sustainable agricultural innovations and women's rights through local organisations.

2.3. Constructs/Variables Related to the Discussion

The constructs for discussion include:

- a) Roles and Responsibilities of men and women among Ameru of Tigania, Meru County [productive roles, reproductive roles, community participation and community politics];
- b) Assets-what livelihood assets and opportunities do men and women have access to? [Human assets such as levels of education, natural assets such as land and labour, social assets such as social networks, physical assets, such as ICT and financial assets such as access to capital, credit];
- c) What constraints do they face;
- d) Power and decision making-what decisions do men and women make? [Decisions about household expenditure and management of community resources];
- e) Needs, priorities and perspectives-what are the needs of men and women? What perspectives do they have on sustainable agricultural and empowerment of women? [Practical gender needs such as access to water points, energy; strategic needs that can change the position of women and perspectives on delivery of systems].

3. Integration, Monitoring Change, Scaling-up and Challenges

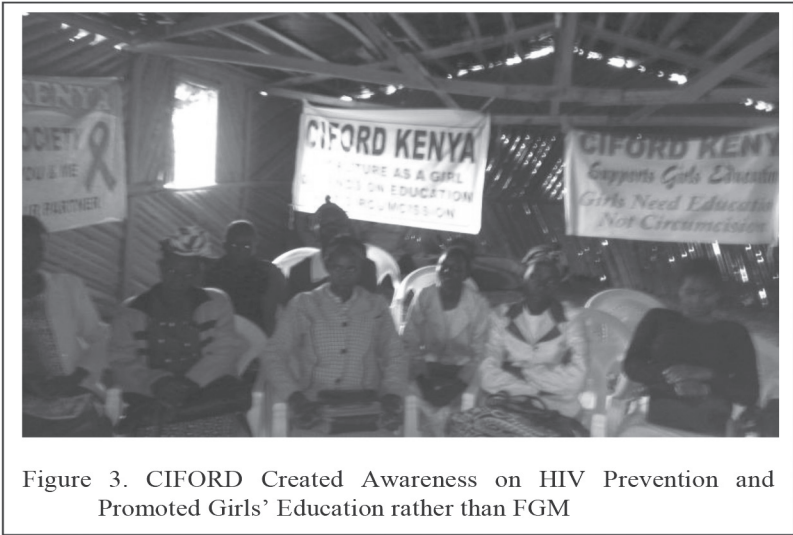
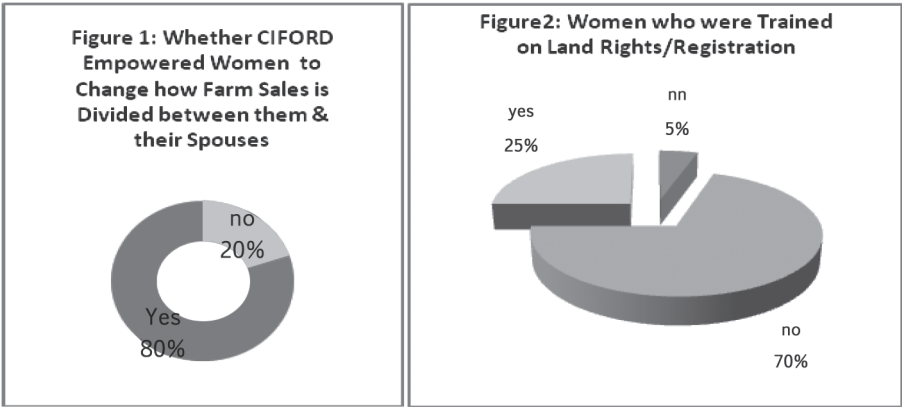
3.1. Integration

Results show that CIFORD's activities enabled most women (32/40, 80%) to both participate in socio-economic development at household and community levels apart from changing the way cash from farm sales is divided between them and spouses (Figure 1). The change in decision-making regarding use of resources enabled women to save both cash and agricultural produce; unlike before, thereby enhancing food security of households. Commenting on how CIFORD had changed her life, a beneficiary observed, *"I have learnt how to save cash in the bank from farm sales for household needs rather than allow my husband take all of it as was the case in the past."* (Participant, FGD with young beneficiaries, 11/6/2014) CIFORD emphasised trainings on agro-ecological innovations to improve food security. Such trainings were integrated with activities to empower the girl-child through seminars that condemned retrogressive cultural practice of female genital mutilation (FGM). CIFORD created awareness on negative reproductive health outcomes of FGM, appealed to girls to totally reject the practice and instead pursue higher education. Consequently, there is an increase in the number of girls enrolled in schools and those who complete class eight. Such an increase in proportion of girls accessing higher education, in a context where early marriages occurred, would ultimately translate into positive outcomes of food security for households. Educated girls are more likely to access loans that the Government of Kenya provides to women for business to improve livelihoods, food and nutrition security of households than illiterate ones. CIFORD also organised seminars for women to create awareness on HIV/AIDS prevention, family life education and women's right to utilise their husband's land and farm outputs as equal partners in marriage as stipulated in the new Constitutional dispensation of Kenya. Empowerment of women to access and plant food crops on spouses' land aimed at increasing food security of households. Women started intercropping food crops such as maize and beans with khat and tea that belong to men. Inter-cropping of cash with food crops increased the amount of food crops produced in households unlike the period prior to initiation of the GFW project in Tigania. Two seminars were organised for men to encourage them to live peacefully with spouses and participate in socio-economic development of the area instead of letting women bear the burden of farm labour as demanded by Ameru culture. Indeed, some men claimed that they had supported spouses to make composite manure that translated into good harvests of food crops unlike in the past when manure was not used.

Stakeholders confirmed their participation in varied activities spearheaded by CIFORD where awareness was created on economic empowerment, income generation activities, environmental conservation through ownership of tree nurseries and planting of trees on the Kuon Hill, empowerment of girls and women on sexually transmitted infections, HIV/AIDS, drug abuse, prevention of respiratory diseases, eye inflammations, high blood pressure and the need to save cash through use of improved cooking stoves. When beneficiaries were asked whether CIFORD had created awareness on their rights, the majority emphasised agricultural innovations only. A respondent observed:

We have been taught methods of improving kitchen gardens: double digging, multi-storey gardens, *mudhara* gardens, nine seeds per hole, raised and sunken beds, fertility trenches and making of composite manure. I have not been taught about women's rights but probably CIFORD trained other people who are not here or is planning to train us on those topics." (Participants, FGD with young beneficiaries, 11/6/2014)

A staff of CIFORD reiterated, "*Our beneficiaries focus on agriculture because field officers follow them up to ensure varied agro-ecological technologies are adopted. Otherwise, CIFORD trains beneficiaries on women's rights including family life education, joint use of resources, negative effects of FGM and HIV/AIDS prevention* (See, Figure 2 and 3). *We have equally started convening seminars for men to create awareness on different topics.* (Participant, FGD with CIFORD staff, 11/7/2014) Indeed, results confirmed that CIFORD had empowered beneficiaries to a very large extent (Case studies 1, 2 and Figure 1). Despite the great economic and empowerment milestones gained, most women (28/40: 75 per cent, Figure 2) and FGD results identified apparent gaps in the beneficiaries' awareness of human rights on issues such as their right to land/registration, safe sex and steps to take in the event of rape as well as how to address domestic violence among others. Yet the apparent limited access to land and poor health of some women resulting from rape and domestic violence reduces food production and threatens food and nutrition security of households.



3.3. Monitoring Change

3.2.1. Indicators of Change in Sustainable Agriculture and Food Production

Despite persistent drought that prohibited most households (30/40, 75 per cent) from producing adequate food in the last 12 months (Table 1, Box 1), CIFORD had noted improvements in food and nutritional security over the years with most beneficiaries (14, 70 per cent) having earned over Ksh 8,500 [USD 100] from selling farm produce in the last one year. (Figure 4) Some survey households experienced tremendous farm production increase with the highest and the lowest rates of 400 per cent and 25 per cent respectively.

(Table 2) Families produced their own food and sold surplus because of increased availability of healthy food. In most cases, women produced and processed food products while men supported marketing activities. The sale of surplus food meant that many households produced enough food; hence, improved food security. Slightly more than half of households 22 (56 per cent) entirely relied on their farms for food. Households that produced food crops at small scale had something to eat from their farms, especially vegetables, since the majority (36/40, 90 per cent) owned kitchen gardens (Table 2). Results show diversity in food crops grown that improved nutrition of people in the study area. When asked about changes that had occurred due to CIFORD's activities, a participant reiterated,

We used to cook maize and beans; starch only with no greens nor tomatoes. But now, we have vegetables from the kitchen gardens. We consume balanced diet these days because most families use tomatoes and fruits unlike before. These days our food is good. Children used to have "swollen" stomachs with brown hair but this does not happen anymore. (Participants, FGD with Males, 11/8/2014).

- High uptake of new agro-ecological innovations among 635 CIFORD beneficiaries and their peers; specifically, kitchen gardens and making of composite manure
- Increased agricultural production and crop output due to the use of manure and integrated pest management using organic products. Production of maize increased from one bag per half an acre to 12 to 15 bags (Participant, FGD with men, 11/8/2014).
- Many beneficiaries consume home grown food crops and save cash for use on non-food needs such as school fees. Surplus is sold and cash used for socio-economic development.
- Stakeholders, such as the agricultural officer reported collaboration in training s such as composting and integrated pest management for better outputs.
- There was reported diversity in food types consumed for better nutrition outcomes.
- Improved varieties of sweet potatoes tubers are grown with higher production.
- Drought resistant indigenous crops such as cassava, arrow roots and sorghum have been re-introduced by many farmers.

Box 1. Indicators of change in sustainable agriculture and food production sector

Improved farm production is an outcome measure of high adoption rate of agro-innovations by beneficiaries of CIFORD as seen in the following excerpts:

They [CIFORD staff] have shown us [beneficiaries] how to make composite manure. Long ago, we used to plant large pieces that performed poorly due to poor soil nutrients. I used to harvest only one sack from a half an acre. These days, I harvest 15 bags from the same land due to applying manure. (FGD with male participants, 11/8/1014).

I have learnt to make the nine seed hole and trenches that increase maize yield on my farm. I was at home when an officer from CIFORD taught my wife and her group members the two technologies. I listened keenly so as to help my wife practice what she had learnt. If left alone without [male] support, a woman cannot manage [to introduce new innovations on her farm]. (FGD with male participants, 11/8/2014).

I planted a kitchen garden to improve the nutritious status of my family. I have planted different types of crops: spinach, amaranth, kales, tomatoes, pepper, onions and beans. We were taught how to purify used water using ash to neutralise detergents prior to sprinkling it on vegetables. Due to CIFORD, my family eats nutritious food and we do not buy food from the market like in the past. (Participant, IDI, Case Study 1).

Table 1. Indicators of improved food security and nutrition

Activity	Yes	No	Total
Food grown in the last 12 months was adequate to feed his family	10 (25%)	30 (75%)	100
Possession of a kitchen garden	36 (90%)	4 (10%)	100
Source of food for the household	Farm (20, 56%)	Farm + Market (16, 44%)	
Link between improved food security & living conditions of women	36 (90%)	4(10%)	100%
Daily Supply of Health food for family	Improving 28(70%)	Declining 12 (30%)	100%
Number of satisfying meals HH consumes in a day	Three meals 36 (90%)	Two meals 4 (10%)	100%
Diversity in Crops Grown			
Crop 1 as maize	28 (70%)	12 (30%)	100
Crop 2 as beans	28 (70%)	Maize 10(25%)	Bananas 2(5%)
Others=black beans, cow peas, Green grams, Ground nuts,	Tomatoes, Kales, Cassava, Sweet potatoes, papaws	Spinach, Onions, Pepper, Amaranth,	Mangoes, Millet, Peas,
Yield of Maize Before Involvement with CIFORD	Yield of Main Maize after Involvement with CIFORD		
Beneficiary 1=1 bag	5 Bags	400% Increase	
Beneficiary 2=6 bags	8 Bags	33.3% Increase	
Beneficiary 3=2 bags	3 Bags	50% Increase	
Beneficiary 6=10 Bags	15 Bags	50% Increase	
Beneficiary 10=20 Bags	25 Bags	250% Increase	
Beneficiary 19=4 Bags	10 Bags	150% Increase	
Beneficiary 20=3 Bags	12 Bags	300% Increase	

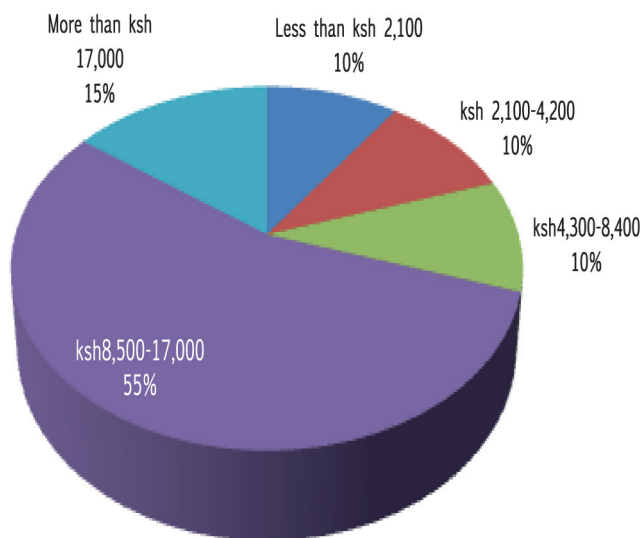


Figure 4. Cash Income Earned from Selling Produce in the Last 12 months

[A]Two Examples of CIFORD's Most Important Agro-Ecological Innovations

Case stories of a Multistory Portable Garden and Zai Pit or Nine Seeds per Hole are presented as two examples of CIFORDS most important agro-ecological innovations (see Box 2).

[b] Income Diversification and Generation

Beneficiaries of CIFORD diversify their income through involvement in varied activities. Many farmers plant tree nurseries for sale, keep goats and sell milk, make bricks, keep chicken, plant and sell tomatoes, pepper, vegetables and fruits (See case studies 1 and 2). When explaining how she generates money, a farmer said, "I sell tree seedlings to CIFORD and forest officers. I also produce sweet potatoes and mangoes in large quantities. I make milk using soya beans to sell to my neighbours and obtain shares after table banking of my self-help group." (Farmer, FGD with young participants, 11/6/2014).

A person who learnt about CIFORD activities from peers remarked, "I have 100 tree seedlings for sale after planting enough on my farm. I occasionally sell timber and also make manure for sale to people in the village. I get Ksh1000 [USD 11.76] from sale of manure per wheelbarrow." (Participant, FGD with men, 11/8/2014) The fact that men equally acquired skills of new agricultural innovations and utilised it to generate revenue implies that the GFW project empowered both genders for improved food security unlike the past whereby power relations denied women access to land: men planted cash crops on most of it. The current scenario improves food security of the entire household.

A Multistory Portable Garden

CIFORD perceived Multistory Portable Gardens as one of its most important and adopted agro ecological innovations. The problem of food insecurity and malnutrition is worse during dry seasons and CIFORD has trained farmers to utilize such gardens to ensure sustained supply of food to members of households. Multistory or portable gardens are made from sacks and crops grown around them. They are easy to manage and are made from local available materials: two sacks, thread, top soil, manure and sand in the ratios of 3:2:1, respectively; four small posts and small stones. The procedure for making the gardens is as follows: a) cut the length and base of two sacks to enable them spread out; b) Use a thread to join the lengths of the two sacks; c) Mix top soil, manure and sand in good proportion; d) put posts in the sack and mark where to insert them later on; e) dig small holes for the posts to be supported firmly; f) insert the sacks on the posts; g) place a small container with two openings at the centre of the sack and add stones to it; h) add the mixture of the soil in the sack and unfold as you add more mixture until it fills up; i) lift the small container as you add more stones until it comes to the top; j) make holes on the sides of the sack in an alternating manner in readiness for planting; j) plant food crops of your choice and water them regularly using recycled water. However, water hither to used for domestic use must be purified using ash prior to using it to water food crops.

Zai Pit or Nine Seeds per Hole

This is a technique whereby small pits 20 to 30 centimeters in diameter and 10–20 cm deep are dug into degraded soil, often hard pans. Pits are dug in the dry season. At the bottom of the pits farmers place about two handfuls of organic manure. The top soil is mixed with manure to prevent evaporation while the sub-soil is loosened to enable roots of food crops to penetrate for better production. Thereafter, 9 or 5 seeds are planted in the hole. The top soil and manure are required in the ratios of 2:1. The procedure for preparation is as follows: a) measure a square of 1 foot; b) dig 1 foot underground, remove the soil and put it aside; c) dig the sub-soil [1foot] to make the hole 2 feet in total and heap the soil on the opposite side; d) Mix the top soil with manure and return it to the hole; e) ensure that it is sunken by 15 centimeters depth; f) plant food crops of your choice. Commenting on this technique, a farmer said; *“The size of maize is usually very big like the size of my arm. Most farmers like the technique because the harvest is usually good. I used the method to plant onions during the previous dry season and harvested 4 bags of onions.”* (Participant, in-depth Interview, 11/7/2014) Another farmer stated, *“I re-use my pits and they hardly develop weeds; unlike the rest of the farm. All nutrients from manure are used by food crops alone leading to better harvests.”* (Participant, FGD with elderly beneficiaries. (11/6.2014)

Box 2. Multi-storey portable garden and zai pit or nine seeds per hole as the most important adopted agro-ecological innovations

3.2.2. Indicators of Change in Women's Status and Empowerment

[A] Control over Household Money

FGD results show that women make decisions regarding farm activities and also implement them: land preparation, weeding, harvesting and post-harvest management. However, male heads of households play a pivotal role in making decisions regarding crop sales since only 12/40 (30 per cent) of women rated themselves as able to make such decisions. (Figure 5) CIFORD has empowered women (32/40, 80 per cent, Figure 1) to change the manner cash from sale of crops is divided between them and spouses. When asked who controls money in their households, a beneficiary said, "I keep cash from sell of food products but give my husband some cash to prevent him from quarrelling." (Participant, FGD with young beneficiaries, 11/6/2014) A male respondent concurred, "CIFORD has empowered women to generate cash of their own. My wife gives me cash besides shopping for our house. She buys soap, paraffin, exercise books and even bought a goat." (Participant, FGD with men, 11/8/2014) Another man in the same FGD stated,

Women buy everything in the household these days. We [men] no longer give them cash to run the home. I personally stay even for two months without being asked for cash. Women are economically independent now. Men's cash is for education. We now have bank accounts to save for school fees since the household burden has been relieved from us (Participant, FGD with males, 11/8/2014)

Table 2. Level of Awareness of Women's Rights

Participation in Gender Rights/Advocacy Training	Yes	No	Offered by CIFORD		Quality of Training
			YES	NO	
Women rights and laws [land, water, property inheritance]	12 (32%)	26 (68%)	8 (27%)	22 (73%)	A respondent stated "I can access land unlike before"
Women's rights and laws [education, gender, parity and health]	8 (21%)	30 (79%)	24 (80%)	3 (20%)	A respondent said "Women know their rights because many girls have stopped FGM and go to school instead of getting married when teenagers."
Training on relationships and gender based violence	8 (21%)	30 (79%)	6 (21%)	22 (79%)	A respondent stated, "We were taught how to live harmoniously with husbands and other people in the family"
Training on starting, managing and financing business	12 (32%)	26 (68%)	4 (10.5%)	34 (89.5%)	A respondent noted, "It is important to save so as to start a business."
Alternative FGM for younger women	40 (100%)	-	40 (100%)	-	"Every girl has a right to education, not circumcision"
Access to FP and other RH information and services	22 (58%)	16 (42%)	6 (21%)	22 (79%)	"I was taught at the MCH how to plan my family using modern contraceptives"
Participation in local and district forums for rural development	4 (11%)	34 (89%)	4 (14%)	24 (86%)	"It is encouraging because women can now speak at such meetings"

[b] Knowledge of Women's Rights

Apart from empowerment on FGM and family planning/reproductive health (FP/RH) through seminars that were attended by almost all women, 40 (100 per cent) and 22/40 (58 per cent), respectively, had somehow low awareness of other women's rights among beneficiaries (Table 2). Nevertheless, few beneficiaries who attended

such seminars had learnt important lessons as presented in excerpts in Table 2. Additional excerpts from five survey respondents include: “women have a right to speak out and own property”; “say NO to FGM”; “avoid gender based violence”; “have a voice [representation] in the society” and “run to safe space when their lives are threatened”. FGD and IDI results equally reveal that beneficiaries are aware of some of their rights; for instance; right to access land to provide food for family members and a right to speak in public meetings as demonstrated by respondent A in case study 1. Respondent A has risen to be a leader in the community and is confident enough to address both men and women in community meetings contrary to the Ameru culture that expects women to be submissive and dominated by men.

[c] Domestic Relationships

More than half of respondents 27 (67 per cent) felt that their relationships with spouses had improved due to their involvement in activities of CIFORD (see Figure 6). When asked to explain how, a survey respondent observed, “My income has increased; hence, I no longer ask him to give me cash to run our household.” Another farmer said, “Domestic violence has reduced in my house because I produces enough food.” Another one observed, “My husband is now able to do what I learnt at CIFORD; especially compositing and working on the farm.” FGD results equally revealed that some men have started assisting their wives to practice agro-innovative technologies. Commenting on this subject, a beneficiary opined, “Husbands are supportive... But, women do most of the work”. (Participant, FGD with the elderly, 11/6/2014). A CIFORD staff reiterated, “Most men in this area do not work because of their culture that requires them to herd cattle and protect members of their families. If only men could do half the work women are doing, we could change this community.” (Participant, FGD with CIFORD staff, 11/7/2014). To this end, indigenous power relationships impact negatively on food security of households.

Men were asked who makes decisions regarding farm activities. They all said that it was the responsibility of women to make such decisions and implement them as appropriate. “Women make decisions regarding land use. However, we [men] have started changing after being taught the importance of collaborative work by CIFORD. Long ago, all burdens were left to women. The work of men is to manage family property and help their wives with cash if they want financial assistance.” (Participant, FGD with Males, 11/8/2014). An assistant Chief concurred, “Men are taught to be directors and acquire the title of District Commissioner after circumcision. Their role is to direct [their wives and children], but not engage in manual work.” (Participant, IDI, 11/5/2014). In this way, power relations in the indigenous context make women beasts

of burden with the sole responsibility of ensuring food and nutrition security for households.

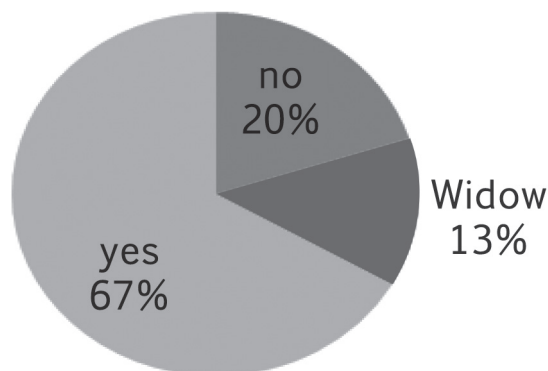


Figure 6. Whether Association with CIFORD Has Changed the Way Beneficiaries Relate with spouses

Men reiterated that they had changed and started helping their spouses with farm work. “Even me, I help her [my wife] maintain the kitchen garden. It has helped us [family] to get food throughout the year. This area is too dry but my wife just plucks vegetables for us to eat, and waters goats with ease. CIFORD is helping women but we men have equally benefited.” (Participant, FGD with Men, 11/8/2014). Another man concurred, “We are helping [women cultivate] because they no longer ask for cash for maintenance. I am so happy that my wife is providing basic needs to my family. I spent my time looking after cattle or discussing politics with my friends at the shops.” (Participant, FGD with men, 11/8/2014). It was interesting to note that acquisition of tanks has reduced the time and energy women used to spend fetching water. Consequently, sexual relationships have improved between some spouses. Availability of water tanks translated to improved food security, sexual relationships and reduced domestic violence. This development was confessed by husbands as,

They [women] have brought us tanks. My wife used to get so tired such that she could request me to cover her when done... These days, she does not get tired because water is available in the tank. Our sexual relationship has improved because she actively participates in the process unlike before we acquired a water tank. (Participant, FGD with men. 11/8/2014).

FGD results revealed that rape is very common phenomenon in the area, including marital rape. When asked whether men proceed with demand for conjugal rights when spouses are tired, all men stated that was the case. A man asked, “What do you expect me to do when

in need [of conjugal rights]? I must cool my [sexual] desire even if she just “lies there.” She is my wife, anyway” (Participant, FGD with men, 11/8/2014). Commenting on this issue, a member of staff from CIFORD said, “Rape is very common in this area. Unfortunately, women are much closed and remain silent because sex is a taboo subject. Besides, perpetrators are people known to women. They have reservations about exposing close relatives as it is stigmatic. How dare you tell that you have been raped by your own blood? For example, yesterday, we learnt that a beneficiary was raped by her drunkard son. She could not tell anyone because of shame. Instead, she pretended to *be sick*. ” (Participant, FGD with CIFORD staff, 11/7/2014). Rape is a gender power issue. Men use it to demonstrate physical power over women. This affects women psychologically and hinders them from participating in the normal agricultural activities of boosting food security to their households.

Results also revealed prevalence of domestic violence in the study area. When explaining how relationships with spouses had changed since their participation in activities of CIFORD, a survey respondent observed, “We were always quarrelling due to lack of food in the house.” Another one noted, “Love between my husband and I has increased because I provide everything for the household and even bought a water tank home.” A man, on the other hand stated, “Women do not want to provide conjugal rights claiming to be tired. This causes conflicts.” (Participant, FGD with Men, 11/8/2014). Another one concurred, “Our cultural practice of initiation for girls (FGM) has destroys a very good part in a woman’s body that could have aroused her sexual desire. Unfortunately, everything has been removed until our women no longer desire to have sex. This practice was intended to keep women faithful in the absence of men. The lack of sexual desire sometimes irritates men then quarrels ensue. We [some men in a group] have been taught how to handle our wives to enable them desire sex.” (Participant, FGD with Men, 11/8/2014). Women were reluctant to comment on the issue even though the moderator encouraged them to comment in general rather than personal context. Results from IDIs and FGD with CIFORD staff revealed the organisation always encounters cases of domestic violence though such incidences are on a decline in households with increased food security:

These women always keep quiet about domestic violence. Women do all the work. They cultivate on free lease land near Isiolo ranch and return home to perform household chores while men relax at shopping centres. Later on, men demand to access money from sale of farm products. This sometimes causes conflicts. For example, there is a woman who is thoroughly beaten every time she returns from the Isiolo ranch where she toils to fend for her family. The husband chases her and sells iron sheets on their roof. The Assistant

Chief is the one who keeps on helping us [CIFORD] to support her (Participant, FGD with CIFORD staff, 11/7/2014).

When asked to comment on why women do not take action, a stakeholder observed that Meru women have been socialised to tolerate pain and mistreatment from men. “Our [Meru] women are advised to tolerate bad circumstances such as the pain and ordeal of FGM. Upon marriage, they are ordered to “go back” to their spouses when they return to their natal homes to complain about mistreatment from spouses. This prevents divorce despite the suffering of some women. Our mothers used to persevere; but today’s parents may not tell their children to persevere in future.” (Participant, IDI, 11/5/2014).

3.3. Most Effective Methods to Scale-up Best Practices of CIFORD

CIFORD trains trainers about new agro-innovations through workshops and demonstrations at the organisations’ office. Three representatives from each of the 17 self-help groups were invited for training on varied technologies. Over half of the survey respondents (22/40, 55 per cent) had participated in such trainings convened by CIFORD on new agro-agricultural innovations (Figure 7). A demonstration field at CIFORD office is used during seminar/workshops; but practical work is done at homes of farmers. Trained farmers are encouraged to cascade acquired knowledge through peer to peer interaction. “There are many people in the community who have adopted modern agro-innovations such as development of composite manure and use of organic materials to deter pests yet they are not affiliated to CIFORD.” (Participant, IDI with CIFORD staff, 11/5/2014) According to a respondent, “It is better for CIFORD staff to visit us [farmers] on the ground. This makes us feel appreciated.” (Participant, FGD with old women, 11/6/2014) Commenting on this model, a participant noted, “The organisation leverages on time by training representatives in order to train many groups at once due to limited staff. Trained farmers are the ones who teach others about the agro-innovations.” (Participant, IDI, CIFORD staff, 11/5/2014).

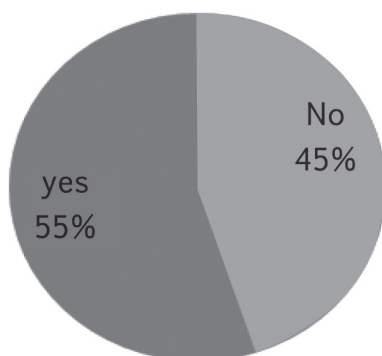


Figure 7. Beneficiaries Who Had Undertaken Training on Agro-innovations

CIFORD also scales-up her activities through collaboration with varied stakeholders and use of self- help groups to disseminate knowledge (Box 3). When asked how they collaborated with stakeholders, a participant observed, “Government officials spoke and still speak positively about our work to encourage rapid uptake of agricultural innovations in the community. Otherwise, men had refused to allow their wives to participate in our activities because they believed CIFORD was against the culture [FGM] of the community. Now such men encourage their spouses to attend our activities so that they can be given water tanks and goats.” (Participant, IDI, CIFORD staff, 11/5/2014).

- **Ministry of Agriculture**-The officer trained on integrated pest management using chemicals, offered technical assistance to CIFORD staff as they trained beneficiaries on agro-innovations such as composting, making of contours and value addition to agricultural products such as making milk using Soya beans. This ensures that the Agricultural Policy of value addition to farm products of CIFORD beneficiaries is achieved for improved agro-income.
- **Ministry of Health**-Beneficiaries who live with HIV and AIDS have been encouraged to register at the comprehensive care centre (CCC) where they obtain counseling, treatment and further prevention of infection services.
- **Kangaroo Theatre**- They hold skits to train people about many issues: HIV prevention, negative effects of FGM
- **Ministry of Forestry**-The officer joins CIFORD in planting trees on the nearby Kuon hill that has been depleted of its original vegetation.
- **Manager of CPK in Tigania East**- Collaborates with CIFORD on new agro-innovations such as sustainable agriculture using mulching to prevent evaporation and create time for other socio-economic activities instead of weeding.
- **Government Administrative Leaders**-Collaborate with CIFORD to convey important socio-economic message through self help groups. For instance, provision of advice on how to access grants provided by the GOK for women and youth for business.
- **Self Help Groups were used to teach new agro-innovations** to many people at once.

Box 3 . How CIFORD collaborates with stakeholders and uses self help groups to scale-up its best practices

Striving for Financial Sustainability

CIFORD strives to include the community in its activities, through Self -Help Groups (SHGs), to enhance sustainability. The organisation secured funds to purchase water tanks, goats and installation of improved cook stoves. These items are not distributed to members free of charge. Instead, beneficiaries are required to pay 5per cent of the total cost of the items. The cash will be used to purchase similar items to enable other members of groups to equally own water tanks, goats and improved cook stoves. In addition, CIFORD owns a guest house that generates some cash for the organisation. The Provincial Administration has offered land to the organisation for construction of a Demonstration Centre where food crops will be grown using innovative techniques and sold to the public. The centre will comprise a Girl Child; Centre with hostels for girls in need of protection and a modern guest house for income generation. The sponsors of CIFORD are shown in Box 4.

- Global Fund for Women (GFW)
- Embassy of Sweden, Nairobi
- UKAid from the British people
- Act Changieni
- Vasil Mali
- Seed Brot (fur die weit)
- Swedish Society for Nature Conservation

Box 4. Funding Sources of CIFORD

3.4. Facing Challenges

[a] Structural Challenges

- i) CIFORD's implementation of the sustainable agriculture, food security and poverty reduction project was resisted by men who prevented spouses from attending CIFORD's meetings. Men protected their patriarchal power and feared a possibility of economically empowered spouses opting for divorce instead of performing all productive roles in homesteads. According to a participant, "Men were afraid that their wives could leave them and seek other men if empowered economically." (Participant, FGD with young beneficiaries, 11/6/2014) Gender power relationships were at play with men fearing to lose power if women joined the GFW project, yet it [project] aimed at ensuring food security for households

When we started doing this work, it was a threat to me until we got support of the Provincial Administration. Every time women could come for meetings, men could say they [women] have gone to be spoilt by that woman. CIFORD was very consistent and sought support of the Provincial administration. Some men could prevent wives from going to seminars. Administrators had to talk positively about the organisation. Then water tanks came. So men began seeing CIFORD as a good organisation. Otherwise, men are afraid of empowered women in the Meru community. Some refuse to marry educated and employed women due to desire to control male power and ego. (Participant, FGD with CIFORD staff, 11/7/2014).

Mitigation Measures: Administrators spoke positively about activities of CIFORD and self- help groups were used to disseminate new information. They encouraged community members to adopt new agro-ecological innovations and empowerment knowledge for improved food security and livelihoods. Furthermore, CIFORD introduced water tanks and goats that elevated the status of men. These outcomes transformed men's hitherto negative attitude towards CIFORD to a positive one. Men currently encourage spouses to attend meetings in order to benefit from CIFORD.

- ii) At the policy level, some politicians wanted to ride on the good work of CIFORD though demands to preside over public gatherings where tanks were supplied to members of the community.

Mitigation Measures: CIFORD requested politicians to participate on condition that they brought their own water tanks for distribution to members of the community. This demand discouraged politicians from attending such public meetings.

[b] Organisational Challenges

i) The Human Resource

CIFORD faces a serious lack of human resource since its thin staff of 9 people cannot exhaustively address needs of 17 affiliate members. The organisation faces high staff turn-over due to underpayment. CIFORD operates on meager resources for programmes but lacks financial capacity to retain well trained staff who can cope with increased workload. Unfortunately, most donors hardly subsidise staff salaries.

Mitigation measures: CIFORD employs volunteers or graduates from colleges with minimal financial demands compared with well trained staff with many years of experience. In addition, peer learning through farmer led trainings; field days and competition among SHGs are held to leverage resources for the benefit of the entire community.

ii) Management under Uncertain Conditions

CIFORD has a thin staff that mostly focuses on training agricultural techniques and monitors activities of trained farmers on a weekly basis to assess whether or not they have adopted new innovations. Qualitative results show that the organisation lacks a robust monitoring and evaluation department to document best practices and analyse monitoring data to inform implementation of the program.

Mitigation measures: CIFORD is attempting to strengthen this weak link in the value chain. Development of a data base is underway to ascertain what each of the 17 affiliate groups has, the amount of cash that groups have paid to CIFORD, number of beneficiaries who have received goats and water tanks, among others.

iii) Stories of Two Beneficiary

The following case stories from two beneficiaries tell a lot about what CIFORD did to them.

Case Study 1

Elizabeth belongs to the Tharichia Women Self Help Group that has been affiliated to CIFORD for the last 14 years. Previously, Elizabeth was a poor farmer who experienced food insecurity due to frequent drought, erratic rainfall, inability to afford farm in-puts and lack of agricultural techniques that could translate into better yield of food crops. These challenges translated into food insecurity and poverty at her household. However, her situation changed after joining CIFORD. A was trained on new agricultural innovations that she adopted for improved livelihood. She grows diversified food crops for domestic and commercial purposes as shown in the excerpt: *"I do not buy any food. As you can see, I have planted a variety of food crops for domestic use. If you plant one crop, you will be forced to sell it so as to buy something else to eat. I sell surplus food at the market, for example, a bag of sweet potatoes at Ksh 4,500 or Ksh 5,000. Miraa ([khat] belongs to my husband but I am allowed to plant food crops like pumpkin, maize, kales, spinach, pepper and beans in between the cash crop."* (Elizabeth, In-depth interview, 11/7/2014). Prior to joining CIFORD, Elizabeth owned a grass thatched kitchen with a three stone fire. The traditional cook stove used much firewood and emitted a lot of smoke that led to frequent headaches and coughs among members of her household. When she joined CIFORD, she learnt how to plant many types of vegetables in a kitchen garden using modern agricultural techniques. A produces enough food crops for domestic use and sells surplus at the nearby market. She uses the cash to provide basic needs to members of her family such as paying school fees for her daughter at a teacher training college. The girl has been hired but she currently educates two more children using farm outputs. Elizabeth purchased iron sheets, and obtained bricks from her group, to construct a kitchen and install an improved cook stove. She reiterated, *"CIFORD has enabled me to own an iron roofed kitchen and improved cook stove that I never imagined to be possible. The cook stove cost Ksh 600 from savings of agricultural products. It uses only two pieces of firewood and saves fuel, emits less smoke and is safe unlike three stone fires that used to burn my children. Again, members of my household no longer fall sick frequently unlike before due to reduced smoke emissions. I also cook inside the kitchen unlike before when I preferred outside to avoid smoke and soot emissions."* (Elizabeth, In-depth Interview, 11/7/2014)

CIFORD encouraged members to plant tree nurseries because firewood had been depleted from the nearby forest. Prunes her trees for cooking and no longer buys fuel. Long ago, she used to purchase two bundles of firewood from the forest at a cost of Ksh 250 to be used for two weeks. However, these days, she prunes one bundle of firewood for use for a month. Sometimes she uses charcoal pellets that members of her group were taught how to make from ash, saw dust and remains of charcoal.

A also owns a water tank that she purchased from CIFORD at a cost of Ksh 5,000 for storing water for irrigating crops in her kitchen garden, watering livestock and for domestic use. She bought a goat from CIFORD and sells young ones and milk to further improve her savings in a bank account she opened due to cash flow from CIFORD initiated activities. A has earned respect from her husband due to significant contributions she has made to development of the household. Her self esteem has been raised and currently serves as the village leader in the Government of Kenya. She frequently addresses community gatherings and represents her village at other meetings convened by administrative leaders in Meru County.

Case Study 2

Respondent B equally belongs to the Tharichia Women Self-Help Group. Her life has improved tremendously since she joined CIFORD. She planted tree nurseries and tomatoes from which she generated capital to purchase materials for construction of an iron roofed kitchen and main house. She has planted a lot of tomatoes using the raised bed technique. She harvests the crop three times a week for sell and makes about Ksh 6,000 weekly. Prior to joining CIFORD, she owned a grass thatched house with no separate kitchen. She used a traditional three stone fire for cooking. Currently, Ann uses an improved cook stove she purchased from CIFORD at Ksh 700.

When asked to state what she owns, she observed; “I own a house, kitchen, improved cook stove, goats and chicken. I built the main house and kitchen using my money. My husband only provided labour by cutting trees I had planted for construction. He owns a cart and transports my tomatoes to the market for sale. My life has improved because we hardly quarrel unlike before when I used to depend on him to provide for the family. I provide basic needs to my family and save the rest in a bank account. We get food and other basic needs like paraffin easily. This has resulted to peace in my marriage unlike before when I experienced a lot of domestic squabbles”. (Respondent B, in-depth interview, 11/7/2014).



Fig. 8a–f. A Pictorial Illustration of Some of the Things CIFORD Has Done to a Beneficiary

4. Synthesis of the Findings

The case study shows the contribution of CIFORD towards sustainable agriculture, enhanced food security and empowerment of women to participate in socio-economic development at the household and community levels. CIFORD trained beneficiaries on modern agricultural innovations that resulted in **increased food production**. Although the project targeted women, their spouses equally acquired skills on agro-innovations through community demonstrations at the household level. Households of beneficiaries

consume **balanced diets**, which have improved the health of children, unlike in the past when many could be spotted with swollen stomachs and brown hair [malnutrition] due to over dependence on starch [boiled maize]. There is **diversity of crops** grown [maize, beans, spinach, green pepper, amaranth, paw paws, bananas, mangoes] and re-introduction of indigenous drought resistant crops such as cassava, sorghum, arrow roots and sweet potatoes. Beneficiaries sell surplus food, consequently, they are **entitled** to open bank accounts, own property; construct permanent houses, purchase water tanks, improved cook stoves and dairy products. These benefits have improved relationships between husbands and wives. Women have become respectable in the eyes of their spouses, as producers rather than dependents and incidences of domestic violence have declined. Female beneficiaries have gained recognition in the community as leaders of self help groups affiliated with CIFORD. Beneficiaries' self-esteem has been raised to an extent that some have been appointed as village leaders by the Government of Kenya. Women and girls have been empowered to exercise their rights to access clean water and reproductive health, respectively. Women speak out in community gatherings to demand for water from County leaders while girls are reluctant to do so. FGM and report potential perpetrators to CIFORD or administrative leaders who protect them and apprehend culprits, accordingly. gender- power relations have improved due to increased food security of households.

An integrated approach to sustainable agriculture, food security, poverty reduction and empowerment of women on their rights that was evolved by the GFW is revolutionary in a rural patriarchal community where male dominance is prevalent. Contrary to the Lenses of Gender that reinforces patriarchal power of men, an integrated approach breaks many barriers and empowers women to equally access property, become aware of their rights and demand for their rightful share in political dispensation as leaders and decision-makers. This approach bridges the gender gap that had hitherto denied women access to resources such as land, credit facilities and education. Collaboration with many stakeholders such as government officials, medical practitioners, forest officers and agricultural officers is commendable. This helps leverage resources to ensure positive outcomes in the area of focus. For instance, CIFORD collaborates with the agriculture and forest officers to add value to farm products and management/sale of tree nurses respectively. The emphasis on self help groups has created **social capital** to support farmers who prepare farms in groups, prior to planting by making raised beds, sunken beds, *madhara* gardens and seven seeds per hole innovations] as well as manure. In addition, the groups create opportunities for members to **access credit facilities** from the

Government of Kenya and banks that prefer to provide loans to groups [for security] rather than individual women.

The programme of GFW has addressed the **gender gap in technology** on sustainable agriculture innovations since beneficiaries are able to prepare their farms and improve yields using the new technologies they have learnt from CIFORD. The programme has narrowed the **gender gap in rural labour** supply since some men are now participating in farm preparation, planting and sell of farm produce leading to a reduction in **gender gap in rural markets** as opposed to the situation before the initiation of the sustainable agriculture programme in Tigania, Meru County. Generally, the programme has attempted to reduce gender inequalities in human capital, improved women's knowledge about their rights and provided a voice through participation in leadership where decisions are made.

The case study shows positive outcomes of involvement of women in sustainable agricultural innovations. It is critical to recognise and reduce gender inequalities in access to productive resources and technological opportunities in agriculture as a condition for increasing the sector's contribution to sustainable development, poverty reduction and food security (World Bank 2009). The sustainable agricultural innovation system (SAIS), advocated for by the World Bank, and adopted by the GFW, has the potential to contribute to mainstreaming gender perspectives by taking into account the many actors involved in the value chain. The actors involved in the value chain constitute the diverse organisations that facilitate education, research and extension services as well as policies, attitudes and practices that frame agricultural research, education and training, production and trade. The SAIS framework attaches great importance to matters of equality in access to technology, inputs, services and decision-making processes (Work Bank 2009). The technological transformation for sustainable agriculture will require the creation of an enabling conditions at all levels of agricultural research, policy and value chain to support a full, fair and viable participation of women in sustainable systems of food production.

Whereas the program of GFW has attempted to collaborate with many stakeholders, greater achievements could be made with inclusion of ITC in the value chain. Mobile phone technology could be adopted to air message/feature from CIFORD as a ringtone since most elderly female beneficiaries cannot read text messages. Again, electronic mass media, specifically vernacular radio stations, could be used to inform more people about new agro-innovations that are advocated for by CIFORD for enhanced food production to increase food security, improve nutrition status and reduce poverty of

households in Tigania, Meru County. Introduction of water tanks improved relationships among spouses and elevated the status of men, who in turn became more respectful of their spouses. Both men and women have unmet need for water sources – a commodity that could help alleviate water stress through irrigation and use in green houses. Young girls who rejected FGM have pursued education to that more girls than boys are now completing primary and secondary school education in Tigania, Meru County.

4.1. Theoretical Reflections

Gender should be mainstreamed in agriculture, food security and policy programs (World Bank, FAO and IFAD 2009). Increased participation of women and their empowerment by ensuring equal access to resources [land, farm inputs and credit facilities] are sound components of financial and social policies that will help eradicate food insecurity and improve nutrition status of the community at large. This study fills an apparent gap in knowledge by introducing an integrated approach that is revolutionary and contrary to Androcentric lens of Gender Theory that perceives men's experiences as the norm (Bem 1993). The lens of Gender Polarisation emphasises differences in experiences of men and women. The sustainable agriculture programme of GFW neutralised the apparent differences in the agricultural sector where men were perceived as the norm and received information on new innovations in agriculture (World Bank 2013). Female beneficiaries were taught knowledge and skills on sustainable technological innovations in agriculture which they cascaded to their male counterparts that did not hitherto participate in productive work as demanded by the Ameru culture. The programme has enabled some men to support spouses in farm preparation. This practice has reduced the gender power imbalance that hitherto existed in the Ameru community and contributed to food insecurity. Other men now regard their spouses positively as significant contributors to household economy due to income from farm products, possession of water tanks and goats. Such perception is an improvement over the previous perception where women were believed to be inferior to men: a position that was legitimised through the Biological Essentialism arm of the Lenses of Gender.

4.2. Recommendations

The case study of CIFORD provides evidence of increased food production from the GFW's initiative of sustainable agriculture, food security, access to resources and empowerment of women.

Focus should be laid on the furtherance of support for rural women to produce food crops to mitigate the challenge of food insecurity, nutrition, poverty reduction and climate change in Africa.

More funding should be directed to rural women due to their immense contribution towards improved food security that ensures better livelihoods and socio-economic development at the household and community levels.

Including rural women or mainstream gender in the planning and conducting of agricultural programmes aimed at improving food security, environmental conservation and adaptation to climate change and

Increasing resilience of farmers to effects of climate change through provision of improved seeds, diversification of crops, and use of manure and biological methods of keeping pests at bay Are also recommended. Gender -power gap will be neutralised if strategies aimed at increasing food security incorporate women as was the case with the GFW project.

The work of CIFORD has empowered some women who now serve as leaders in their communities. Need arises to include such rural women at decision- making tables that influence policies that impact their productivity and rights. These includes budgetary decisions at the County level where urgent needs of women such as the right to access water should be prioritised to improve the welfare of women and boost agricultural productivity.

An integrated approach should be adopted through collaboration with other stakeholders and addressing of all spheres that affect livelihoods of people in rural communities: socio-economic, cultural and political as well as empowerment on women's rights. CIFORD should continue using administrative leaders and self-help groups to disseminate new information as agents. CIFORD needs to make a follow-up after trainings on empowerment just like the sustainable agriculture component. It should also diversify women's rights trainings beyond FGM and health.

Evidence from the CIFORD case study demonstrates that peer-to-peer training is a very effective method of cascading knowledge on agro-innovations in rural communities rather than relying on technical support of experts who are very expensive and cannot reach many farmers within the shortest time possible.

The solidarity among members of women self- help groups and their ability to learn from each other is a pointer to greater collective action. Through these groups, so much change can be achieved to mitigate the effects of climate change and bridge the gender gap that has hitherto denied women access to resources and assets to improve the food security of their households.

References

- Agwu, E. A., F. O. Amadu, T. A. Morlai, E. T. Wollor and L. W. Cegbe. 2011. Agricultural innovations for climate change adaptation and food security in West Africa: The case of Nigeria, Siera Leone and Liberia. *The African Technology Policy Studies Network (ATPS)*, (61): 1–40. Nairobi, Kenya,
- Ambasa, C. 2015. Case study of Community Initiative for Rural Development (CIFORD), Kenya: Rural women striding forward initiative. Evaluation Report conducted on behalf of the Global Fund for Women.
- . 2013. Food security and nutrition in the context of climate change: An assessment of households in tea producing areas of Kenya. Report for Food and Agricultural Organization of the United Nations.
- . 2009. *Cultural determinants of adoption of HIV/AIDS prevention measures and strategies among girls and women in western Kenya*. Addis Ababa: OSSREA. 38–6.
- Bem, S. L. 1993. The lenses of gender: *Transforming the debate on sexual inequality*. London: Yale University Press.
- DFID. [n.d.]. Gender analysis framework. Retrieved 23 April 2015 from http://www.genie.ids.ac.uk/gem/index_sectors/infrastructure/in_tools1.htm.
- FAO. 2012. *State of the world's land and water resources for food and agriculture*. Rome: FAO. Retrieved April 20 2015 from <http://www.fao.org/docrep/015/!1688e00.pdf>.
- . 2011. *The state of food and agriculture*. Rome: FAO.
- FAO/OECD. 2012. Building resilience for adaptation to climate change in the agriculture sector. Proceedings of a Joint FAO/OECD Workshop. FAO, OECD, Rome. Retrieved on April 20 from <http://www.fao.org/agriculture/crops/news-events-bulletins/detail/enitem/134976>
- FAO, WFP, and IFAD. 2012. *The state of food insecurity in the world 2012. Economic growth is necessary but not sufficient to accelerate reduction of hunger*. Rome: FAO. Retrieved April 20 2015 from <http://www.fao.org/docrep/016/13027e00.htm>.
- Fine, B. 2004. Economics and ethics: Amartya Sen as point of departure. *The New School Economic Review*, Vol. 1, (1): 151–62.
- Fugille, K.O., S. L. Wang and V.E. Ball. 2012. *Productivity growth in agriculture: An international perspective*. Wallingford, United Kingdom: CABI.

- Habtezion, S., T. Scott, Wanjiru, L. and A. Babugura. 2012. Gender, agriculture and food security. *Gender and Climate Change Capacity Development Series, Africa: Training Module*, (4): 1–20.
- Heidhues, F. A, Attsain, H. Nyagito, M. Pagilla, G. Ghersi and J. Le Vallee. 2004. Development strategies and food and nutrition security in Africa: An assessment. *International Food Policy Research Institute Discussion Paper*, no.(38): 13–17.
- Kisinger, G., M. Herold and V. Desy. 2012. Drivers of deforestation and forest degradation: A synthesis report for REED policy makers. Lexeme Consulting , Vancouver, Canada. Retrieved April 20 2015 from https://www.gov.uk/government/uploads/attachment_data/file/65505/6316-drivers-deforestation-report.pdf.
- Mehra, R. and M.H. Rojas. 2008. *A significant shift: Women, food security and agriculture in a global marketplace*. Washington, D.C.: International Centre for Research on Women (ICRW).
- Migotto, M., B. Davis, Carietto, G. and B. Kathleen. 2005. Measuring food security using respondents' perception of consumption adequacy. *FAO: Agriculture and Economic Development Analysis Division (ESA) Working paper*, 10, no.5 (February 3–15).
- O'Hearn, D. [n.d.]. 'Amartya Sen's Development as freedom: Ten years later', policy and practice: A *Development Education Review*, Vol. 8(spring): 9–15.
- Rosen , S. B. Meade, S. Shapori, A. D'Souza and N, Rada. 2012. International food security assessment, 2012–22. Economic research service, USDA, Washington, D.C. Retrieved April 20 2015 from <http://www.ers.usda.gov/publications/gfa-foodsecurity-assessment-solutons-and-outlook/gfa23.aspx#.uhzGXBae3s8>.
- Sen, A. 1999. *Development as freedom*. New York: Alfred A. Knopf..
- United Nations. 2013. Solutions for sustainable agriculture and food systems: Technical report for the post-2015 development agenda. Thematic Group on Sustainable Agriculture and Food Systems of the Sustainable Development Solutions Network: A Global Initiative for the United Nations. New York.
- . 2006. *Millennium Development Goals Report*. New York. UN.
- Vander Stichele, M. 2008. Ignoring the crises? How further GATS liberalisation impacts the financial and food crises. *South Centre Bulletin*, Transnational Institute, 18 June 2008: http://www.tni.org/detail_page.phtml?&act_id=18398.
- World Bank. 2013. Turn down the heat: Climate extremes, regional impacts and the case for resilience. A report for the World Bank by Potsdam

Institute for Climate Change Impact Research and Climatic Analytics.
Retried April 22 2015 from
<http://documents.worldbank.org/curated/en/2013/06/17862361/turn-down-heat-climate-extremes-regional-impacts-case-resilience-full-report>.

———. 2009. *Gender in agriculture: Source book*. Washington, D.C.: World Bank.

World Bank, Food and Agricultural Organization (FAO) and International Fund for Agricultural Development (IFAD). 2009. *Gender in agriculture: Sourcebook*. New York.

CONCLUSION

Herman Musahara

By way of a conclusion, many issues arise for consideration. Two of these are what new ideas or knowledge do we get? Are the conclusions useful and living up to the expectations of the knowledge harvest product? The overall conclusion of the work serves to answer the same questions and to assess the value addition of the findings in the chapters. Since this book is a product of a knowledge harvesting exercise, another interesting issue is looking at the policy implications of the findings and possible grey areas that would provoke further research. The sections that follow look at briefly the conclusion drawn by each author in the light of findings. This is followed in the penultimate section by an overall assessment of the work and concludes with accent on its implications for food security.

Maloba's chapter has treated a rare and unique issue of indigenous knowledge and the strategies of harnessing it with modern scientific knowledge to promote multi-stakeholder partnerships in the food security of Kenya. On account of its relevance to knowledge harvesting, one county of Kakamega was taken as a case study. The findings are forthright. There exists indigenous knowledge in the food in/security arena. But it needs to be disseminated and integrated into modern scientific technology. There are also gender-power dynamics in the food in/security questions of Kakamega County. Across all inquiries of sustainable food security, the gender dynamics need to be considered. It is important to read the chapter critically. But by all means, institutional innovations are indispensable elements of change for food security.

Kenya is used to analyse another institutional and social innovation by Ambasa. A holistic strategy for overcoming barriers to women's access to participation and capacity-building in sustainable development is strongly recommended. The findings are, by no means, exclusive to Meru County of Kenya but are also applicable to the whole country and the region. The conclusion capitalises on the support for grassroot institutions to yield better results.

Musahara has made a panoramic view of indicators of food security challenges in Eastern and Southern Africa. The indicators used are those of the Food and Agriculture Organisation of the United Nations which makes a clear distinction among availability, access, utilisation and stability in food security. Then, a case study of an institutional innovation by way of Land Use Consolidation is used to demonstrate the importance of the distinction among the various facets of food security for policy-makers. While the overall food security in Rwanda is undeniable, the literature review and the findings reveal

considerable food insecurity beyond availability and access. The conclusion underscores that policies should advance a more comprehensive and holistic meaning of food security. The chapter thus serves to provide an extensive coverage of the region which has constituted the scope of the book.

The chapter by Tumushabe is a critique of a persistent problem not only in Uganda but also throughout the whole region. Abuse of policy implementation is a human-made pain that causes food insecurity. In other words, the implementation of institutional innovations is hindered by corruption, poor governance, subjective policies, inadequate human resources, poverty, and inadequate procurement process. The suggested solutions are viable policy control systems, information dissemination, risk identification and management.

The Zimbabwean land tax and its sustainable use for food security in post-land reform is the focus of the chapter by Makaye. It concludes that land tax could be used in conjunction with other interventions for possible sustainable use of the land to ensure food security in Zimbabwe.

Kadzamira's chapter on rural livelihoods and agricultural innovation systems is, in fact, conducted with reference to Malawi. It concludes that research interventions nested in innovation systems have impacted rural livelihoods.

In the chapter on adaptive capacity as food resource handling procedure in rural western Kenya, Gutwa commends that policies should take into consideration adaptive capacities of the smallholder farmers' food resources management if food security has to be achieved. This may also contribute towards reduction of food loss and waste. This is a dimension that needs to be addressed all over the region. The chapter also provides rich information on food security in Kenya. It is described as a paradoxical phenomenon because Kenya is endowed with a lot of resources, but recently ranked 80th among 109 countries. Since 2008, there has been evidence of severe food insecurity in the referent country. The chapter underlines the role of agriculture and smallholder farmers and the role of post-harvest procedures. It provides a generally relevant analysis of the region since productivity among the smallholder farmers is the key to enabling agriculture contribute to food security more effectively.

Ferreira, Botha, Fraser and Du Toit have contributed a unique chapter drawn from a current project intervention in South Africa. Win-LIFE is a project on Wellness in Life style Intake Fitness and the Environment. The innovation relates to transference of nutrition and environmental knowledge in order to support food secure households. So far, the project has been incorporated into the South

African Life Skills curriculum. The value of the chapter lies in its pragmatic approach to innovation. Just as food security is complex, interventions often involve interdisciplinary approaches to maximise security outcomes.

Workeneh has contributed a chapter on Ethiopia. It focuses on institutions and technological innovations in smallholder farmers. On the bases of the data collected from two *woredas* or districts, it concludes that farmers and agro-pastoralists view their demand for technological innovations in a holistic manner. They consider biological, mechanical, chemical, management/organisational technologies and knowledge, skill, risks, and marketability in the process of decision-making regarding technological innovations. The chapter has underlined the importance of developing sound institutional arrangements for rapid technological transformation.

All in all, we have different emergent dimensions of innovations for food security. This further indicates that the stock of institutional and social innovations for food security may be larger than we imagine given that the chapters were selected from scores of others submitted in responses to the call for knowledge harvest on the theme.

In discussing the innovations, a lot of data have also been generated explaining the conditions and interpretations of food security in the region. Not all countries were covered and as deeply as would be desirable to get a nuanced picture of food security. It is expected that more evidence on efforts to tackle the food insecurity will emerge as a result of the initiatives covered in this book.

The knowledge harvested in the book is expected to be quite significant for sustainable development. The first lesson from MDGs was that poverty has not been fully challenged in many countries, especially, in Sub-Saharan Africa. Goal number 1 and 2 of the new Sustainable Development Goals is on hunger and poverty. Food insecurity is at the core content of poverty and at the centre of the new Goals. Solutions to food security through innovative ways will mark the period under the new goals.

But, the most important contribution of the book appears to be the uptake of what has been found out. As in other knowledge harvesting exercises, the book provides a forum for policy dialogue and engagement. At both regional and national levels, policy-makers and other stakeholders will have the opportunity to deliberate on the viability of the recommendations and their operational strategies in Sub-Saharan Africa.

About the Book

Food insecurity has been a serious challenge confronting people in Eastern and Southern African Countries. Its impacts on the wellbeing and socio-economic growth of these nations in general and of the rural poor in particular have been profound. In fact, following the deepening of knowledge about the causes and consequences of food insecurity and the broadening of the cutback strategies in view of the right to food as a universal human right, impacts of food insecurity directly on humans seem to be decreasing from time to time. Starting with the previous focus on increasing food production and availability, efforts have these days broadened to include issues of accessibility and affordability, as well. But yet, achieving food security has continued to be a real challenge of the people, governments, and other actors in the sub-region. To curtail the problem, there is now a remarkable shift of focus to innovation and innovation systems in food security.

This anthology entitled *Innovations in Achieving Sustainable Food Security in Eastern and Southern Africa* documents institutional and technological innovations. The chapters present hands-on experiences and case studies in Uganda, Malawi, Rwanda, South Africa, Kenya, Zimbabwe, and Ethiopia. The chapters traverse through issues such as access to resources and productive assets, mainly land, by different groups and segments of people; gender-power relations; ways of increasing food production; institutional arrangements and bottlenecks; implementation challenges; welding together indigenous knowledge and scientific knowledge; and encouraging lessons from the different initiatives. Based on the evidence they contain, most of the chapters draw implications for policy, practice, teaching and research in food (in)security. Many of them also make viable recommendations and suggest frameworks.

As such, the book is a commendable reading for policy and decision-makers, implementers, researchers, educators and students who strive towards the ultimate goal of achieving sustainable food security in the Eastern and Southern Africa sub-region and beyond.

**Research and Publications Directorate
OSSREA**

ISBN 978-99944-55-87-4

